MONTHLY WEATHER REVIEW.

Editor: Prof. CLEVELAND ABBE. Assistant Editor: FRANK OWEN STETSON.

VOL. XXXII. AUGUST, 1904. No. 8

INTRODUCTION.

The MONTHLY WEATHER REVIEW for August, 1904, is based on data from about 3300 stations, classified as follows:

Weather Bureau stations, regular, telegraph, and mail, 167; West Indian Service, cable and mail, 4; River and Flood Service, regular 43, special river and rainfall, 190, special rainfall only, 56; voluntary observers, domestic and foreign, 2565; total Weather Bureau Service, 3025; Canadian Meteorological Service, by telegraph and mail, 20, by mail only, 13; Meteorological Service of the Azores, by cable, 2; Meteorological Office, London, by cable, 8; Mexican Telegraph Company, by cable, 3; Army Post Hospital reports, 18; United States Life-Saving Service, 9; Southern Pacific Company, 96; Hawaiian Meteorological Service, 75; Jamaica Weather Service, 130; Costa Rican Meteorological Service, 25; The New Panama Canal Company, 5; Central Meteorological Observatory of Mexico, 20 station summaries, also printed daily bulletins and charts, based on simultaneous observations at about 40 stations; Mexican Federal Telegraph Service, printed daily charts, based on about 30 stations.

Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Mr. R. C. Lydecker, Territorial Meteorologist, Honolulu, Hawaii; Señor Manuel E. Pastrana, Director of the Central Meteorological and Magnetic Observatory of Mexico; Camilo A. Gonzales, Director-General of Mexican Telegraphs; Capt. S. I. Kimball, Superintendent of the United States Life-Saving Service; Lieut. Commander H. M. Hodges, Hydrographer, United States Navy; H. Pittier, Director of the Physico-Geographic Institute, San José, Costa Rica; Commandant Francisco S. Chaves, Director of the Meteorological Service of the Azores, Ponta Delgada, St. Michaels, Azores; W. N. Shaw, Esq., Secretary, Meteorological Office, London; Rev. José Algué, S. J., Director, Philippine Weather Service; and H. H. Cousins, Chemist, in charge of the Jamaica Weather Office; Señor Enrique A. Del Monte, Director of the Meteorological Service of the Republic of Cuba.

Attention is called to the fact that the clocks and self-registers at regular Weather Bureau stations are all set to seventy-fifth meridian or eastern standard time, which is exactly five hours behind Greenwich time; as far as practicable, only this standard of time is used in the text of the REVIEW, since all Weather Bureau observations are required to be taken and recorded by it. The standards used by the public in the United States and Canada and by the voluntary observers are believed to conform generally to the modern international system of standard meridians, one hour apart, beginning with Greenwich. The Hawaiian standard meridian is 157° 30′, or $10^h\ 30^m$ west of Greenwich. The Costa Rican standard meridian is that of San José, $5^h\ 36^m$ west of Greenwich. Records of miscellaneous phenomena that are reported occasionally in other standards of time by voluntary observers or newspaper correspondents are sometimes corrected to agree with the eastern standard; otherwise, the local standard is mentioned.

Barometric pressures, whether "station pressures" or "sea-level pressures," are now reduced to standard gravity, so that they express pressure in a standard system of absolute measures

FORECASTS AND WARNINGS.

By Prof. E. B. GARRIOTT, in charge of Forecast Division.

August opened with a continuation over the North Atlantic Ocean and the American Continent of the comparatively quiet weather conditions that had prevailed during June and July. The only notable feature of the first decade of the month was a strong ocean current running north off Cape Hatteras at a reported rate of 2 to 3½ knots an hour, that detained south-ward-bound sailing vessels between Cape Henry and Cape Hatteras. A possible explanation of this phenomenon is found in abnormally high barometric pressure that covered the West Indies and the ocean to the northward and caused an unusual prevalence of fresh southerly winds off our south and middle Atlantic coasts.

During the second decade a storm of marked seasonal strength advanced from the middle longitudes of the Atlantic and crossed the British Isles on the 14th and 15th. On the 20th the first energetic storm of the summer crossed the Great Lakes and was attended by winds that reached a maximum velocity of 60 miles an hour at Buffalo, N. Y.

Throughout the month, generally, barometric disturbances in the United States were confined to the northern part of the country, and during the last half of the month they increased in intensity and were attended by isolated local storms of great severity, the most important of which occurred over the middle and upper Mississippi Valley and the southern part of the Lake region. The only important frost of the month occurred in the States of the upper Lake region on the morning of the 8th. This frost followed the passage of a disturbance that developed over Wisconsin during the night of the 6th, moved eastward to the Canadian Maritime Provinces during the 7th and 8th, and passed thence over the ocean. The importance of this disturbance lies in the fact that its origin was obscure, that it produced unlooked-for rains in the upper Lake region, was largely responsible for the occurrence of the frost referred to, and that during its advance over the Atlantic it developed into the first storm of marked energy that had appeared over the eastern Atlantic in several weeks. It is interesting, at least, to also note that five to six days after a renewal of storm action over the eastern Atlantic the first well-defined storm of the summer occurred over the eastern United States. This is another of a number of instances that have been observed in which periods of quiescent weather over the eastern United States have been preceded five to six days by marked changes in atmospheric conditions that have existed over the eastern Atlantic.

NORTH PACIFIC FORECAST DISTRICT.

The month in the North Pacific States was unusually warm and very dry, especially in the forested sections of the district. These conditions were conducive to forest fires, which early became numerous and continued throughout the month without any great check. A large amount of good timber was destroyed, but not much other property was damaged and no lives were lost so far as learned. The smoke from these

fires was at times very dense, and it gave an unnatural aspect to the sun and sky, dimmed visibility, and had a general depressing effect upon the people.

No windstorms occurred and no warnings were issued. Near the close of the month it became cooler and frost warnings, which were partially verified, were issued for eastern Oregon and southern Idaho.—*E. A. Beals, District Forecaster.*

NORTH-CENTRAL FORECAST DISTRICT.

Several storms passed over the Lake region during the month for which warnings were issued, but no destructive storms causing any serious amount of injury to traffic occurred. On the 9th storm warnings were issued for a storm which developod over the Missouri Valley; on the 19th for a storm then central over northern Illinois; on the 24th for a storm then central over Minnesota, and again on the 29th for high northeast winds. In addition to these warnings, advisory messages were sent on two or three occasions.

Frost warnings were sent to the cranberry-growing region of Wisconsin on two or three occasions.—*F. J. Walz, District Forecaster and Inspector.*

SOUTH PACIFIC FORECAST DISTRICT.

The season has been an unusual one in the southwestern portion of the United States. While a reasonable precipitation may be expected along the Mexican boundary during July, August, and September, averaging 6 inches in southeastern Arizona, 2 inches in northern Arizona, and about 0.6 of an inch in western Arizona, with variations depending upon the altitude of the mountains, it is quite unusual to have precipitation in excess of the above figures. In the year 1889, during July and August, the rainfall in southeastern California, Arizona, and probably northwestern Mexico was excessive. It is believed that the year 1871 was a year of excessive rainfall. The present season has been marked by an unusually large number of thunderstorms, cloudbursts, and subsequent washouts. During the months of July and August, 1889, the rainfall at Flagstaff, Ariz., for example, was 5.65 inches, while for the same period during the current year the rainfall was 12.29 inches. Transportation companies, particularly the Atchison, Topeka, and Santa Fe Railroad, and the Southern Pacific Company of Arizona, had great difficulty in operating, and at some points trains were stalled for a period of five days. No sooner was the roadbed repaired than another heavy rain would again wash it out.

The pressure distribution during this period will, doubtless, show, when charted, an extensive trough of low pressure, reaching from the Valley of the Colorado northeastward through Colorado and Wyoming.

The month was a quiet one, on the whole, in northern California, and also along the coast north of Point Conception. In the Sierra Nevada and in the mountains of southern California, thunderstorms occurred nearly every day during the month. There were no storm warnings issued. A thunderstorm occurred at San Francisco on August 24. No rain had previously fallen on this date for forty years. On the same date thunderstorms were reported generally in the Sacramento Valley.—*Alexander G. McAdie, Professor and District Forecaster.*

WEST GULF FORECAST DISTRICT.

August weather presented no unusual feature. No conditions appeared that called for special warnings.—*I. M. Cline, District Forecaster.*

ROCKY MOUNTAIN FORECAST DISTRICT.

Warnings were issued to points in Wyoming twenty-four hours in advance of the frost that was general in that State on the morning of the 22d. Cool nights were common throughout the district, but the feature of the month was the unusually large number of local thunderstorms with heavy downpours or cloudbursts. These were confined principally to the mountain and foothills districts, and, while the increased water supply was of great value to irrigation interests in the Plains region, the benefits were offset by loss of property along the upper courses of the streams. The railroads in Arizona, northern New Mexico, and southern Colorado suffered serious interruptions to traffic and large pecuniary loss by the washing out of roadbeds and bridges. The cloudburst of the evening of the 7th caused a terrible loss of life by drowning in the flood that swept down an arroyo, 1 mile north of Eden, a station on the Denver and Rio Grande Railroad, 8 miles north of Pueblo. The bridge at this point, weakened by the flood that was sweeping down the valley, gave way under the weight of a train, dashing all but the sleeping cars into the torrent and drowning the occupants; of these the bodies of 89 were recovered. The bridge had an opening of 758 square feet for the draining of the watershed, which has an area not exceeding 12 square miles of rolling country, in which the maximum elevation is 300 feet. The volume that was emptied into Fountain Creek, near by, was not measured, but it was enormous, considering the small drainage area. At the Santa Fe Bridge, 1 mile to the westward, where the area drained is correspondingly smaller, the volume was about 8300 second-feet.—*F. H. Brandenburg, District Forecaster.*

RIVERS AND FLOODS.

During August the usual summer conditions of comparatively low water prevailed over the various watersheds of the country, except in the Southeastern States, where there were some decided rises due to heavy local rains. The stages reached, however, were not abnormal and, except along the watershed of the Alabama River, the results proved rather beneficial than otherwise, especially to the navigation interests. Warnings of the approaching waters were issued at opportune times, and they were well verified. Along the Tallapoosa, upper Coosa, and Alabama rivers the warnings were issued in ample time to allow the planters to throw up temporary levees across low places in the river banks, and they were thus enabled to keep out the flood waters that would otherwise have overflowed the grain and cotton fields in the lowlands. It is estimated that crops to the value of $25,000 were saved as a result of the warnings, while the losses of those that could not be protected probably amounted to twice as much.

Along the upper Tennessee River timely rains during the first week of the month permitted the resumption of navigation on the 6th, and for two weeks after a sufficient supply of water for steamboat traffic was maintained by the aid of almost daily showers.

The highest and lowest water, mean stage, and monthly range at 213 river stations are given in Table VII. Hydrographs for typical points on seven principal rivers are shown on Chart V. The stations selected for charting are Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.—*H. C. Frankenfield, Professor.*

CLIMATE AND CROP SERVICE.

By Mr. James Berry, Chief of Climate and Crop Service Divison.

The following summaries relating to the general weather and crop conditions during August are furnished by the directors of the respective sections of the Climate and Crop Service of the Weather Bureau; they are based upon voluntary reports from meteorological observers and crop correspondents, of whom there are about 3000 and 14,000, respectively:

Alabama.—Weather favorable for corn and minor crops, except too dry north and west, though cotton made fairly good progress in those

districts. Heavy to excessive rains in middle and southern counties caused cotton to deteriorate steadily from rust and shedding; some damage by bollworms and blackroot; early cotton opened freely, and picking active during last decade. Some lowland corn and cotton damaged by overflow; much early corn gathered, yield excellent; considerable fodder saved.—*F. P. Chaffee.*

Arizona.—Moderate temperatures and generally showery weather prevailed during August, and conditions were generally favorable for the rapid growth of vegetation. All growing crops made good progress during the month, corn, sorghum, and garden truck doing especially well. Alfalfa did well, but was very weedy in some localities. Grass on ranges grew rapidly, and at the end of the month was in very fine condition, promising abundant winter feed. Stock water was plentiful and stock improved rapidly.—*M. E. Blystone.*

Arkansas.—Temperature and rainfall were slightly deficient. Cotton began fruiting nicely, but dry weather last of month caused shedding and the crop deteriorated rapidly; some was opening by the close of the month, but no picking was done. Early corn made good crop; the late suffered from lack of moisture and promises short crop. Thrashing was practically completed; good yields of fair quality were secured. Apples and peaches continued dropping and promise fair crops of medium quality—*Edward B. Richards.*

California.—Numerous thunderstorms and cloudbursts occurred during the month in the mountain districts, principally in southern California, and some damage was done to railroads, irrigating ditches, etc. High winds also damaged buildings and orchards to some extent. The heavy rains in the mountains will prove of great value to agricultural interests. The few days of extremely hot weather caused rapid ripening of grapes and late fruits, and but little injury to the grape crop. Raisin making is in progress.—*G. H. Willson.*

Colorado.—Month favorable, but showers interfered with haying. Harvesting of grain, native hay, and second crop of alfalfa practically finished. Thrashing under way, with generally good yields, but spring wheat poor, on account of rust; fall plowing begun, and some wheat sown in Arkansas Valley. Beets, potatoes, corn, and alfalfa made good growth; in some localities corn already beyond danger of frost. Fine crops of apples, peaches, pears, plums, melons, and cantaloupes marketed; prospects for late fruit excellent.—*F. H. Brandenburg.*

Florida.—Previous dry weather, followed by frequent rains over the cotton counties, caused a decided falling off in the condition of that staple, and at the close of the month the resulting damage was very apparent. Corn promised better than expected earlier in the season. Cane and sweet potatoes made fair progress. Pineapple slips improved greatly with the more frequent rains. Growing vegetation was making fair progress at the close of the month.—*R. T. Lindley.*

Georgia.—During the first half of the month cotton was damaged by too much rain; shedding, rust, and blackroot increased, and too much weed developed; the second half was very favorable and caused a decided improvement; much of the early crop in central and southern sections opened and picking became general. One of the largest corn crops in years was made secure by the favorable weather conditions. Much hay and fodder was saved. All minor crops prospered.—*J. B. Marbury.*

Idaho.—The weather was excessively warm till about the 18th, becoming much cooler after that date; the climax of the cool period was about the 21st and 22d, when frosts were general. Precipitation was deficient in northern and some central districts, resulting in a shortage in the grain and hay crops; elsewhere these crops were yielding well. Fruit was good. Melons were abundant. Sugar beets promised satisfactory returns. Potatoes were below average.—*Edward L. Wells.*

Illinois.—General rainfall the latter part of the second decade relieved pronounced droughty conditions that had seriously affected the corn crop over a considerable area; grasses also had suffered. At the end of the month a decided improvement in growing vegetation was noted. Thrashing operations continued, with few interruptions, and were nearing completion by the 31st. The month closed with favorable outlook for potatoes, plums, and grapes, but apples were generally disappointing.—*William G. Burns.*

Indiana.—The month was cool, and damaging drought prevailed to the 18th. Thrashing wheat and harvesting oats and timothy were completed early in the month; wheat yield light; oats and timothy fairly good. Corn suffered from drought, and about the 20th much was blown down; most of it raised, however, and a fair crop was in prospect. Potatoes fairly promising. Tobacco prospects poor. Apples defective and crop light. Pear crop fairly promising. Grapes and plums abundant. Clover and pastures in good condition and fall plowing well advanced.—*W. T. Blythe.*

Iowa.—Though the nights were unseasonably cool, the days were mostly bright and warm, and as a whole the month was favorable for advancement of immature crops and for stacking grain, thrashing, fall plowing, and harvesting wild hay. The corn crop became unusually rank and heavily eared, and though belated gave promise of an average yield. Large crops of early potatoes and fall apples were matured; minor crops made fair yields, and pasturage was abundant.—*John R. Sage.*

Kansas.—By the close of the month early corn was being cut in the south, and was maturing in the central and northern counties. Late corn grew rapidly and in the southern counties was practically made. Prairie haying was general and a large crop was saved. Apples were plentiful in many counties, but were falling badly in others. Cutting the third crop of alfalfa began the third week and a good crop was generally secured. Potatoes made a good crop. Peaches and grapes were ripe and abundant. Thrashing continued. Plowing for fall seeding was in progress.—*T. B. Jennings.*

Kentucky.—The temperature averaged a little below the normal for the month. The rainfall was a little less than normal, but it was unevenly distributed, some localities having abundant rain while others suffered at times from drought. Corn did well generally, but in some localities it was injured by drought. Tobacco made fairly good growth and was generally in good condition. Fruit deteriorated, apples dropping badly. Pastures, meadows, and gardens needed more rain.—*H. B. Hersey.*

Louisiana.—Frequent showers first half of month followed by two weeks of hot, dry weather proved unfavorable for cotton. More or less shedding was reported and bollworms and caterpillars did some damage. Mexican boll weevil was found in eight localities along the western border of the State, but damage was reported from only a few places. Hot, showery weather caused sugar cane to develope rapidly. Rice harvest was interfered with by showers early in the month, but later the crop was housed as rapidly as possible. Corn was maturing at the close of the month. Fall gardens made good growth. Hay making progressed satisfactorily.—*I. M. Cline.*

Maryland and Delaware.—Rainfall was generally ample until last decade. Thrashing was almost completed. Early corn matured a good crop, late damaged by drought. Much fine fodder secured in southern counties. Tobacco mostly housed and cured splendidly, late crop reduced by dry weather. Fruit fair, except apples, which were scarce. Sugar corn very fine, tomatoes fair. Potatoes abundant and good. Plowing was well advanced first half of month, but preparations for seeding were delayed by drought during the last decade.—*H. B. Wren.*

Michigan.—Temperature uniformly cool and precipitation unevenly distributed. Harvest scarcely interrupted. Corn made slow and generally healthy growth and eared well. Oats were mostly secured during first decade. Drought in late July and early August shortened yields of peas and early beans. Late potatoes, sugar beets, late beans, buckwheat, apples, plums, and grapes continued promising. Pastures were poor until 20th, when they were slightly improved. Plowing became general during second decade; during last decade rye seeding began in the southern counties.—*C. F. Schneider.*

Minnesota.—Spring wheat cutting began on 4th in south, advancing northward with cutting of barley and oats, and all harvest nearly finished by 30th. Rust attacked western and northern wheat, with considerable injury. Stacking, shock thrashing, and flax cutting began about 15th. Corn improved most of month. Potatoes ripening at end of month. Very light frosts in south on 8th. Loss of life and great damage by storm, Renville to Washington counties, on 20th. Plowing begun.—*T. S. Outram.*

Mississippi.—Owing to heavy rains the first half of the month, cotton grew too rapidly to fruit well on lowlands, but was very satisfactory on uplands. The rather abrupt change to hot, dry weather about the middle of the month generally caused cotton to blight and shed seriously, except in a few localities where there was sufficient moisture. A fine crop of early corn matured and much fodder and hay were saved. Late corn, pastures, and minor crops were promising.—*S. D. Flora.*

Missouri.—During the first fifteen days of August corn suffered to some extent from drought, and a small part of the crop was permanently damaged. Copious rains fell on 17-20th over the entire State, however, followed by decided improvement in all growing crops. The advanced part of the crop was out of danger of frost, cutting being in progress in localities. Thrashing was completed; wheat yields were disappointing. Plowing for fall seeding began during the latter part of the month.—*George Reeder.*

Montana.—High temperatures during the greater part of the month caused rapid growth of all irrigated crops. Drought prevailed until near the close of the month, causing serious deterioration in ranges and unirrigated crops in nearly all sections. Wheat harvest began early in the month and continued to its close. Weather favorable for haying, which was carried on throughout the month. Scarcity of stock water caused suffering among cattle and sheep on the northern ranges the latter half.—*R. F. Young.*

Nebraska.—Harvesting was completed early in August. Stacking and shock thrashing progressed rapidly and were practically finished soon after the middle of the month, with much less damage than usual from unfavorable weather. An excellent crop of hay was being secured the last half of the month. Corn made satisfactory progress toward maturity and was generally promising, but dry weather in southern counties caused slight deterioration.—*G. A. Loveland.*

Nevada.—The month was favorable for the growth and development of all crops. The harvesting of hay and grain progressed nicely, with better than average yields in most districts. Frequent cloudbursts in eastern and southwestern sections the latter part of month did considerable damage to crops, country roads, railroad tracks, and canyon ranches. Potatoes and other vegetable crops made good progress. Range feed was fairly good and stock of all kinds did well. Irrigation water was generally plentiful throughout the month.—*J. H. Smith.*

New England.—The month was cool, with much sunshine. During the last four days light frosts occurred quite generally in northern interior districts, but caused no appreciable injury. The rainfall was slightly above normal, but as little fell after the 20th the month closed with a general need of rain. Favorable conditions prevailed for the maturing and harvesting of crops. An abundant crop of apples of excellent quality seemed assured. Potatoes promised average yield, although there was considerable rot locally. An excellent crop of tobacco was secured.—*T. L. Bridges.*

New Jersey.—The month was chiefly noted for its unequally distributed rainfall, that came in the form of remarkably heavy local thunderstorms over limited areas of all sections. Hot, sultry days were few and the number of clear and fair days unusually large. At the close of the month all crops were well advanced toward maturity, except in the southern section, where late tomatoes, potatoes, and other truck crops were suffering from the long absence of rain.—*Edward W. McGann.*

New Mexico.—Showers were well distributed and water holes and lakes on mesa lands were filled. Heavy rains fell in mountain districts, increasing the flow in streams and irrigating ditches. Under the favorable conditions gardens were revived, stock improved rapidly, and grass on ranges made excellent growth and greatly increased the prospects for winter feed. At close of month harvesting of wheat, oats, and alfalfa was under way and hay of good quality was being stacked.—*J. B. Sloan.*

New York.—Temperature during first eight days favorable, but local showers hindered the harvest; remainder of month generally too cool, and frosts occurred in colder sections on the 9th, 19th, 24th, 27th, and 29th; latter half of month generally too dry. Corn gained rapidly, but was very backward; potatoes suffered from blight and rot, but promised a large yield; beans damaged by rust; large yields of oats and barley; pastures and milk supply declined rapidly; tobacco, hops, and buckwheat fine; large crop of good apples and plenty of grapes promised; some wheat sown.—*R. G. Allen.*

North Carolina.—First twelve days showery, followed by clearer weather, which was very favorable for minor crops and farm work, but came too late to prevent a marked deterioration in cotton, through shedding. Corn was generally maturing well, and a fine crop was nearly assured. Tobacco leaves were curing nicely, but the crop was rather short. Peanuts were doing well. Turnips, rutabagas, and fall potatoes were generally up before the close of the month. Fruit was turning out poorly.—*A. Wiesner.*

North Dakota.—The month was cooler than usual, and while favorable for filling small grain, was unfavorable for growth of corn and flax, which were in a very unsatisfactory condition. Harvest of early grain continued after the first week with only slight interruption by occasional rainstorms, except in the northeastern section, where heavy rains not only delayed harvesting, but did considerable damage to crops.—*B. H. Bronson.*

Ohio.—The month was generally too cool for the best growth of crops; light frost occurred in northern counties during the latter part. The wheat yield was indifferent and of poor quality; oats large yield; buckwheat promising. Cutting of field corn began the last of the month, condition fair. Potatoes promising. Tobacco promised fair yield and cutting was in progress. Pears were good. A large crop of plums was secured. Grapes were good. Peaches fair on high ground.—*J. Warren Smith.*

Oklahoma and Indian Territories.—Cool weather and excessive precipitation prevailed. Wheat thrashing was about completed with poor to fair yields. Early corn secured with fair to good yields, late injured by dry weather in some localities. Cotton made good growth, some opening and being picked; some damage by bollworms and shedding. Kafir and broom corn, cane, millet, milo maze, hay, and castor beans were being secured with good yields and quality. Late potatoes did well. Fruit generally gave light yields.—*C. M. Strong.*

Oregon.—August was extremely dry in all sections of the State and vegetation in general made little advancement. Light scattering showers occurred in the western section on the 27th and 28th, but the amount was insufficient to be of much benefit, except to clear the atmosphere of smoke, which had become dense and oppressive. Fall grain harvest was practically completed and thrashing was general by the second decade. Fall wheat gave excellent results.—*Edward A. Beals.*

Pennsylvania.—Month closed with pastures and soil in fine condition and plowing well under way. Wheat crop satisfactory in most districts; oats yielding heavily. Tobacco being cut and returns favorable. Buckwheat filling nicely and early sown ripening. Early corn earing well, but late needing higher temperature to insure maturity. Potato crop good in most districts. Peaches on highlands better than expected. Winter apples developing nicely; other fruits and vegetables plentiful and of excellent quality.—*T. F. Townsend.*

Porto Rico.—Local showers the first three weeks in the northern section and moderate showers the last week throughout the island. Most crops suffered little damage from the drought or the heavy showers. Cane continued in good condition, giving promise of a fine crop. The yield of coffee was small, but of good quality. Cotton proved a very satisfactory crop and an increased acreage will be planted. Rice did poorly. Small crops and fruits were abundant and of good quality, and pastures remained in fair condition.—*M. A. Robinson.*

South Carolina.—Precipitation excessive, but harmful over small areas only. Temperatures were generally favorable, although too low during the last week. Crops developed rapidly and favorably, except cotton on light soils, on which rust and blight developed extensively, causing shedding; some bolls opened, and picking was begun in southern portions. Early corn ripened and late became very promising. The weather was favorable for rice, sweet potatoes, sugar cane, and minor crops generally. Much fall truck was planted.—*J. W. Bauer.*

South Dakota.—Conditions were favorable for harvesting of small grains, haying, stacking, and thrashing, though rains temporarily interrupted. Harvesting was finished and flax cutting begun in the third decade. Wheat, except macaroni, suffered serious damage from rust, but other grains, potatoes, flax, and hay were good. Corn was injured by drought in some western localities; elsewhere, though backward, advanced fairly well. Pasturage was mostly good. Hail and wind in northeastern counties on the 20th damaged crops locally.—*S. W. Glenn.*

Tennessee.—Except in the eastern division, the rainfall was much below the normal, and in many localities crops, especially late corn and cotton, suffered from drought. Tobacco ripened well, as a rule, and cutting was in progress during the last week of the month. Early corn was generally excellent. Seed clover was in good condition. Cotton was damaged considerably by rust and shedding. Plowing for fall seeding progressed well, except in the dry districts, where it was greatly delayed.—*H. C. Bate.*

Texas.—Good showers were general over the State on the 6th and 7th and daily showers occurred over the southeastern portion during the second week. Good showers also occurred over the northwestern portion during the week ending with the 22d, but at that time the northeastern and middle-western counties began to suffer from drought, and the greater portion of the State was suffering from this cause at the close of the month. High temperatures during the last decade were also detrimental. The cotton crop was in good condition at the beginning of the month, but deteriorated rapidly as a result of continued showers in the southeastern portion during the first half of the month, drought over the northern two-thirds of the State during the last decade, damage by boll weevils in the southwestern, coast, central, eastern, and a number of northern counties, and damage by bollworms in all sections. The bolls opened rapidly after the 15th and picking was general the last few days of the month. Late corn was badly damaged by drought. Rice did fairly well and was being harvested the last of the month. Sugar cane made good growth.—*L. H. Murdoch.*

Utah.—Thunderstorms were frequent during the month. Severe frosts on the 21st and 22d seriously damaged lucerne seed, potatoes, and other vegetables. Farm work was delayed by rains, but harvesting and thrashing were nearly completed, with yields above average. Beets were maturing rapidly and the crop was in splendid condition. Fruit and garden truck were good and plentiful. Ranges were fine and stock was thriving. The supply of irrigation water was amply sufficient to carry all crops to maturity.—*R. J. Hyatt.*

Virginia.—The month was generally favorable for the maturity of outstanding crops. The temperatures were moderate, for the most part, and while the rainfall was below normal, its distribution both as to area and time of occurrence kept vegetation from suffering. Wheat was thrashed and spring oats were harvested. Corn kept in a very thrifty condition all the month and tobacco made excellent progress. Considerable fall plowing was done.—*Edward A. Evans.*

Washington.—Ideal weather prevailed throughout the month for harvesting and thrashing, but it was too dry for gardens, potatoes, and pastures. A fine crop of winter wheat was harvested and thrashed. The spring wheat crop, owing to drought and hot winds, was below the average yield except in the most favorable localities of the eastern and southeastern counties. The oat crop was lighter than average. Potatoes promised only a half crop; hops a fair to good crop.—*G. N. Salisbury.*

West Virginia.—Harvesting was practically completed during August, the weather generally being favorable. Good crops of hay and oats were secured in good condition. Corn made fairly good growth, except over the western-central counties, where drought prevailed. Millet was rather light in some parts. Cowpeas and buckwheat did very well. Light rains started meadows and pastures during the third week. At the close of the month the prospects were for a fair crop of peaches, about a half crop of apples, and a large crop of plums and grapes.—*E. C. Vose.*

Wisconsin.—Killing frost occurred in central and western counties on the 8th, more than a month earlier than the average date. Corn, buckwheat, and gardens were injured to some extent in exposed localities, and the cranberry crop in Wood, Jackson, and Monroe counties was severely damaged, the loss being estimated at about 50 per cent of the crop. The temperature on the marshes was generally from 4° to 6° below the freezing point, and ice formed in many localities. Corn and tobacco grew very slowly on account of the cool weather.—*W. M. Wilson.*

Wyoming.—The month was favorable for crop development and completion of haying. The cool spell from the 20th to 22d damaged tender crops in many sections, especially over the western half. Most of the native hay crop was secured by the middle of the month, and by its close the second crop of alfalfa had been secured generally. A good crop of grain was secured where frosts of the summer had not been too severe. Ranges cured in excellent condition. All stock in excellent condition.—*W. S. Palmer.*

SUMMARY OF TEMPERATURE AND PRECIPITATION BY SECTIONS, AUGUST, 1904.

In the following table are given, for the various sections of the Climate and Crop Service of the Weather Bureau, the average temperature and rainfall, the stations reporting the highest and lowest temperatures with dates of occurrence, the stations reporting greatest and least monthly precipitation, and other data, as indicated by the several headings.

The mean temperatures for each section, the highest and lowest temperatures, the average precipitation, and the greatest and least monthly amounts are found by using all trustworthy records available.

The mean departures from normal temperature and precipitation are based only on records from stations that have ten or more years of observation. Of course the number of such records is smaller than the total number of stations.

Section.	Temperature—in degrees Fahrenheit.							Precipitation—in inches and hundredths.					
	Section average.	Departure from the normal.	Monthly extremes.						Section average.	Departure from the normal.	Greatest monthly.		Least monthly.	
			Station.	Highest.	Date.	Station.	Lowest.	Date.			Station.	Amount.	Station.	Amount.
Alabama	78.4	− 1.2	Newbern	101	24	Maple Grove, Riverton, Valleyhead, Anniston	55 55 55	27 28 29	5.55	+1.11	Goodwater	13.17	Florence	1.38
Arizona	79.7	− 0.3	Fort Mohave	118	5	Flagstaff Fort Defiance	46 46	30 21, 22	3.60	+1.34	Huachuca Reservoir.	9.00	Fort Mohave	0.38
Arkansas	78.1	− 1.1	Newport	105	25	Oregon	46	27	2.77	−0.59	Helena, No. 2	6.40	Osceola	0.33
California	73.9	+ 0.2	Mammoth Tank Volcano Springs	114 114	6 10	Bodie	24	30	0.17	+0.10	Laguna Valley	6.95	42 stations	0.00
Colorado	63.7	− 1.5	Blaine	103	29	Halls Gulch	21	22	2.43	+0.44	Longs Peak (near)	6.50	Las Animas	0.00
Florida	80.1	− 1.1	Clermont	101	19	Monticello	61	5, 6	7.40	−0.13	Sumner	17.46	Malabar	2.53
Georgia	77.6	− 1.4	Westpoint	101	23	Diamond	54	28	7.33	+1.44	Albany	14.33	St. Marys	2.34
Idaho	67.8	......	Garnet	110	15	Chesterfield	21	22	0.42	......	Chesterfield	1.78	Garnet	T.
Illinois	70.7	− 3.0	Equality	98	14, 25	Lanark	37	8	4.12	+1.04	Aledo	7.58	Olney	1.76
Indiana	71.1	− 2.1	Rome	101	14	Auburn, Syracuse, Topeka, Ft. Wayne, Bluffton, Northfield	42 42 42	8 8, 9 27	2.45	−0.82	Syracuse	6.79	Cambridge City	0.87
Iowa	69.1	− 2.7	Mount Ayr, Waukee.	97	13	Earlham	35	8	3.43	0.00	Fort Dodge	6.75	Sibley	0.66
Kansas	74.6	− 2.6	Jetmore Ness City	104 104	28 13	Hanover	38	26	3.35	+0.07	Sedan	9.27	Chapman	1.06
Kentucky	75.2	− 0.9	Cadiz	100	14	Beaverdam	45	27	2.64	−0.13	Mount Sterling	5.52	Scott	0.59
Louisiana	80.2	− 1.2	Libertyhill	102	24	Plain Dealing	53	28	5.19	−0.29	Port Eads	13.31	Caspiana	1.66
Maryland and Delaware	71.9	− 1.9	Boettcherville, Md. Hancock, Md	97 97	1 25	Deer Park, Md Oakland, Md	31 31	27, 31 27	2.91	−0.70	Darlington, Md	8.74	Jewell, Md	0.69
Michigan	63.5	− 2.5	Arbela	91	14	Wetmore Omer	25 25	10 30	2.81	+0.34	Petosky	7.95	Lapeer	1.05
Minnesota	64.9	− 2.5	Beardsley	98	12	Pokegama Falls	27	29	2.77	−0.26	St. Cloud	6.00	Moorhead	0.96
Mississippi	79.4	− 0.8	Laurel	102	24	Austin, Hernando	56	27	4.07	−0.37	Pecan, (Swartwout).	14.18	Indianola	0.65
Missouri	73.7	− 2.2	Warrensburg	100	15	Monroe City	43	23	5.46	+2.31	Maryville	9.51	Doniphan	1.98
Montana	65.1	− 0.2	Springbrook	111	10	Grayling	17	22	0.64	−0.21	Columbia Falls	1.82	Lamedeer	T.
Nebraska	70.9	− 1.7	Kirkwood	104	14	Brokenbow, Hay Springs, Kennedy	36 36	22 22	2.80	−0.02	Grand Island	6.83	Gering	0.54
Nevada	68.6	− 1.2	Sodaville	105	7	Tecoma	22	20, 21	1.81	+1.33	Palmetto	6.95	2 stations	0.00
New England*	65.3	− 2.5	Nashua, N. H	93	1	Vanceboro, Me	30	30	4.30	+0.25	Norwalk, Conn	8.45	Cornwall, Vt.	1.95
New Jersey	70.8	− 1.7	Indian Mills, Bridgeton, Vineland	92 92	1 1, 7	Layton Charlotteburg	37 37	27 24	6.62	+2.14	College Farm	13.01	Cape May	2.65
New Mexico	70.6	− 0.9	Alamogordo, San Marcial.	103	1	Winsors	39	12	2.24	+0.04	Fort Wingate	5.65	Fruitland	0.06
New York	65.6	− 1.5	Berlin, Chatham	94	1	Indian Lake	28	30	3.96	−0.11	Oyster Bay	10.60	Otto	1.63
North Carolina	75.1	− 1.0	Selma	100	21	Linville	40	28	6.24	+0.41	Monroe	11.89	Lewisburg	3.00
North Dakota	63.3	− 2.0	Dickinson	102	2	McKinney	31	2	1.67	−0.21	Cando	5.37	Melville	0.20
Ohio	68.8	− 2.8	Camp Dennison	97	25	Green Hill, Orangeville.	38	27	2.74	−0.11	Oberlin	5.57	Cincinnati	0.41
Oklahoma and Indian Territories.	79.0	− 2.2	Hobart, Okla	107	29	Fairland, Vinita, Ind. T., Grand, Okla	52 52	27 26	3.01	+0.96	Whiteagle, Okla	7.58	Goodwater, Ind. T.	0.50
Oregon	67.3	+ 1.5	Blalock	110	5	Beula, Wallowa Pine Riverside	29 29 29	21 22 20	0.21	−0.39	Warmspring	1.95	13 stations	0.00
Pennsylvania	68.0	− 1.8	Lock Haven	96	1	Grampian, Pocono Lake.	34	27	4.36	+0.33	Easton	9.64	Everett	1.66
Porto Rico	79.1	......	Cayey	98	23	Adjuntas	54	30	8.01	......	Cidra	20.01	Coamo	0.94
South Carolina	77.6	− 1.7	Sumter	102	22	Cheraw, Greenville.	54	28	8.47	+2.17	Effingham	13.43	Aiken	3.92
South Dakota	68.8	− 1.6	Herried	105	3	Ramsey	30	22	2.19	−0.20	Tyndall	5.37	Oelrichs	T.
Tennessee	76.0	0.0	Dover, Lewisburg, Pope	101 101	25 25, 31	Dickson	47	27	•3.00	−0.87	Grace	7.50	Lebanon	1.04
Texas	81.0	− 1.2	Brownwood	109	29	Texarkana Bonham, Graham	52 52	29 30	2.25	0.00	Hearne	6.36	2 stations	0.00
Utah	69.4	− 0.9	St. George Rockville Hite	104 104 104	5, 6 6 14	Soldier Summit	22	22	1.06	0.00	Monticello	3.91	2 stations	0.00
Virginia	72.8	− 1.6	Stephens City	96	22	Burkes Garden, McDowell.	38	28	3.37	−0.86	Callaville	9.27	Stephens City	0.53
Washington	66.2	− 0.2	Kennewick	112	5	Cle-Elum Cusick, Northport	30 30	24 21	0.30	−0.36	Coupeville	1.13	6 stations	0.00
West Virginia	70.7	− 1.3	Martinsburg Moorefield	95 95	1 25	Bayard	32	27	2.88	−1.09	Beverly	6.71	Cuba	0.67
Wisconsin	64.6	− 3.2	Prairie du Chien	95	12	Agr. Exp. Station (near Grand Rapids)	26	8	2.90	−0.04	Butternut	6.56	Menasha	0.59
Wyoming	63.0	− 0.6	Fort Laramie	100	14	Daniel	17	22	1.16	−0.06	Phillips	3.11	Lusk	0.05

* Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut.

SPECIAL ARTICLES.

LOCAL STORM AT ST. LOUIS, MO., AUGUST 19, 1904.

By L. H. DAINGERFIELD, Observer Weather Bureau.

General conditions.—A well-defined storm area was central over northeastern Kansas and southeastern Nebraska on the morning of August 19, the lowest pressure being 29.70 inches at Concordia, Kans., and Omaha, Nebr. An almost ideal cyclonic circulation was evident around the center of the low area, and rain was falling from Iowa and Missouri eastward to Ohio. St. Louis, in the southeastern quadrant of the depression, was favorably located for the visit of severe local storms. By 8 p. m. the storm center had moved eastward to southeastern Iowa, where the pressure had fallen to 29.60 inches, and by 8 a. m., August 20, the center of the disturbance was over the lower Lakes, the lowest pressure being 29.58 inches at Buffalo, N. Y., showing a constant increase in movement and intensity.

Local conditions.—The pressure at St. Louis, at 8 a. m. August 19, was 29.89 inches; there was a constant decline thereafter until about 9 p. m., when the lowest point was reached, 29.66 inches reduced pressure or 29.06 station pressure; the relative humidity was high during the greater portion of the day, 94 per cent at 8 a. m., 91 per cent at 1 p. m., dropping slowly to 79 per cent by 8 p. m. A thunderstorm appeared in the northwest portion of the city during the early afternoon, the first thunder being heard at 2:55 p. m. This storm moved in an easterly direction to the north of the station; it was very local in character, and was confined to the northern portion of St. Louis and Madison. The storm gradually became more threatening over north St. Louis, the cloud movement indicating a rather violent local disturbance in that locality, but at no time did the storm appear especially destructive at any great distance from its path of action. As its course was 2 miles north of the local Weather Bureau office, it was beyond the vision of the observer. At 3:55 p. m. the storm assumed the characteristics of a tornado, violent winds being first noticeable at about No. 3200 north of Market street and No. 2500 west of the river; it moved almost due east, the extreme width of the path being about seven blocks, from No. 3200 to No. 3900 north. It appears to have bounded at intervals, from the fact that its destruction was less marked at some points along its path than at others. The storm evidently reached its maximum strength from Broadway, No. 500 west, to Second street, where telephone and electric light poles were broken and thrown to the ground, and the Broadway street car service was suspended until the next day; the Granite Iron Rolling Mills, No. 3400 north, seemed to have suffered the most severely, the estimated damage being $25,000; about four other business houses were damaged and twenty-five or thirty dwellings injured. The writer personally inspected the damaged district and noted that the damage usually consisted of unroofed buildings, broken poles, electric and telephone wires; at no point did the damage appear to be irreparable or absolute.

The storm, after leaving St. Louis at the river front, passed eastward to Madison and East Madison, where it continued its devastation. The total property loss in St. Louis, according to conservative estimates, does not exceed $100,000, and perhaps about the same amount in Madison and East Madison.

Three fatalities were reported and twenty persons were injured.

A peculiarity of the storm was its extremely local character. While the storm was at its height at 3:55 p. m. in north St. Louis, the central and southern portions of the city experienced only moderate breezes, partly cloudy sky, and but slight changes in temperature. Very little rain occurred, except in the immediate path of the storm. The temperature at 3 p. m. at this station was 83°; 4 p. m., when the storm was at its height, 82°; 5 p. m., 84°; the maximum wind, which occurred at about 4 p. m., was only 24 miles per hour; the barograph trace shows a steady fall in pressure, reaching 29.13 inches when the storm was passing north of the station, with a very slight rise of only 0.03 of an inch shortly after 4 p. m., and falling thereafter to a minimum pressure of 29.06 inches at about 9 p. m. The instruments at the exposition showed even less variation than did the station instruments.

CLOUDBURST NEAR CITRUS, CAL.

By W. E. BONNETT, Assistant Observer, in charge, Independence, Cal.

On August 8 showers were forming over the mountain peaks at 9:30 a. m. (Pacific time), somewhat earlier in the day than seems usual here. They gradually increased in number and extent until about 11:30 a. m., when the entire sky was overcast and threatening. The first thunder was heard at this time. These conditions culminated in very severe thunderstorms in the ranges, both to the east and west of us.

The most excessive precipitation occurred over what is known locally as Mazuka Canyon, cut in the western slope of the Inyo Range. This opens to a gently sloping sage-brush plain, three miles from the station of Citrus. When the flood emerged from the Canyon it spread itself over the fan-shaped deposit there, and flowed with a front of nearly two miles and a depth of several feet toward the station at Citrus. The country over which the water came is wholly uninhabited and the only damage that was done occurred about the station. Here several hundred feet of the railroad track were washed away and for a greater distance it was covered over with débris. One and one-fourth miles of an irrigating ditch, belonging to the East Side Canal Company, was filled up.

THE ANNUAL AND GEOGRAPHICAL DISTRIBUTION OF CYCLONES OF HIGH VELOCITY (OVER 500 MILES IN TWELVE HOURS) IN THE UNITED STATES, 1893-1902.[1]

By STANISLAV HANZLIK, Ph. D. (Prague).

Summary.—The object of the study, the preliminary results of which are herein summarized, was to determine the influence of areas of high pressure (highs), and especially of the so-called St. Lawrence high,[2] upon the velocity and direction of movements of areas of low pressure (lows). In preparation for this investigation, all cyclones of high velocity (over 500 miles in twelve hours) during the years 1893-1902 were considered. No relation between the velocities of cyclones and the barometric gradient could be made out in the case of cyclones in the western portion of the southern circuit.[3]

The reason for this fact was doubtless that of about 130 cyclones in ten years there were about 110 secondary lows, which were deflected to the south, and the laws of the movements of secondary lows, which are under the influence of primary lows, are extremely complex. The 20 primary cyclones remaining showed too little similarity for purposes of comparison. But it distinctly appeared that the relation of the velocity of cyclones to the gradient was such that higher velocities occurred with weaker gradients in front of the cyclones.[4]

The next point taken up was the geographical distribution of the occurrence and of the velocities of rapidly moving cyclones, and, as is shown in the tables and charts which follow, there is a distinct deflecting and splitting effect on the part of the St. Lawrence high in the case of the eastern portion of the southern circuit track of these cyclones. The lows which are deflected to the right of the high move more rapidly than those which are deflected to the left. The splitting in the northeast is most marked in February and March, and there is practically none in January. This is probably due to the nearly equal velocities of lows and highs in January and to the passage of the southern circuit lows to the left of the St. Lawrence high in November and to the right in December.

No definite answer has been obtained to the question set as the object of this study, but some preliminary results have at

[1] Preliminary report on work done during the year 1903-4 in the course Geology 26 (Climatology: advanced course), given under the direction of Prof. R. DeC. Ward, in Harvard University.

The instructor's share in this work has been limited to some general suggestions at the beginning of the investigation, occasional conferences during its progress, and a revision of this report for publication.—ROBERT DEC. WARD.

[2] The term "St. Lawrence high" is attributed to any high which, on its path eastward, hangs persistently in the locality of the Gulf of St. Lawrence, checking the progress of lows from the west.

[3] "Northern circuit" is one main path of circulation of cyclones passing directly eastward (from the Northwest British Possessions) over the Great Lakes and the St. Lawrence Valley to Newfoundland.

"Southern circuit" is second main path of circulation of cyclones along the Rocky Mountain slope southeastward to Texas, thence eastward over the Gulf States to the Carolinas, and thence northeastward to the Banks of Newfoundland.

[4] See E. B. Garriott: Types of storms in January. Monthly Weather Review, January, 1895, p. 10.

least been achieved. In the remainder of the investigation the writer will endeavor to throw some light on the following points:

1. What controls the deflection of rapidly-moving lows to the right or to the left of the St. Lawrence high?

2. Is there any relation between the form, gradients, pressure, and other characteristics of lows and the velocity of progression of the lows?

In the investigation of the second of these two questions, it is hoped that the results obtained will be more exact than has thus far been the case. The difficulty, as above pointed out, in the case of the lows in the western portion of the southern circuit has been the large number of secondary lows. The region of the Atlantic and Gulf States offers primary lows in larger number and in better development.

The charts of the tracks of the centers of low areas published in the MONTHLY WEATHER REVIEW for the years 1893–1902, inclusive, were taken as the basis of this work. The only lows considered were those which, when the tracks were measured, showed a velocity of progression of 500 miles or more in twelve hours.[5] The error in measuring the lengths of the tracks lies within the limits of error of the scale on the maps. It is, therefore, possible that some tracks showing velocities of very nearly 500 miles in twelve hours may have been overlooked.

TABLE 1.—*Number of fast storms.*[6]

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1893	32	18	25	16	14	6	5	2	14	7	17	20	176
1894	21	23	29	2	3	6	5	8	13	5	23	18	156
1895	19	14	15	20	7	1	9	9	13	12	12	18	149
1896	11	20	17	9	8	11	8	14	10	5	19	24	156
1897	14	24	14	7	6	8	6	4	11	14	14	22	144
1898	32	12	16	15	9	11	8	4	7	8	17	8	147
1899	30	21	29	11	9	10	4	1	13	11	14	22	175
1900	26	20	29	7	8	3	14	7	14	8	16	27	179
1901	32	23	16	4	6	6	6	6	10	15	18	23	165
1902	17	8	21	11	9	10	9	7	10	9	7	21	139
Average	23.4	18.3	21.1	10.2	7.9	7.2	7.4	6.2	11.5	9.4	15.7	20.3	158.6

During the whole period under review there were, as shown in Table 1, 1586 cases of at least 500-mile progression in twelve hours. The numbers for the first two years are somewhat larger than they should be, because the maps in the MONTHLY WEATHER REVIEW for those years cover a larger area than do the maps published since. Hence, some lows over the Atlantic Ocean and east of Newfoundland are included in the count, whereas in the maps at present employed these areas are omitted The number of rapidly-moving lows varies from year to year about ± 10 per cent from the mean, the greatest differences in percentages being 87.7 per cent in 1902 and 110 per cent in 1900.

If we follow the numbers of rapidly-moving lows from month to month, we see that the greatest number comes in January, with 23.4 as an average, and the smallest in August, with 6.2.

Three characteristic features of the monthly changes are: 1. A minimum between January and March. February has 18.3 against 23.4 in January and 21.1 in March. Even if corrected by addition of one-tenth, February still has only 20.1 (18.3+1.8). 2. The large number of rapidly-moving lows in September (11.5) in comparison with October (9.4). 3. A slight increase in the numbers in July (7.4) as compared with June (7.2) and August (6.2).

If we note the numbers of fast storms in February in each of the ten years, we see that in six years (1893, 1895, 1898, 1899, 1900, 1902) that month had fewer than January and March, in two years (1896, 1897) February had more than January and March, in one year (1894) it had more than January and fewer than March, in one year (1901) it had more than March and fewer than January. In seven out of ten years March had more rapidly-moving cyclones than February.

In seven years the numbers of fast storms was greater in September than in October (1893, 1894, 1895, 1896, 1899, 1900, 1901).

The maxima do not always come in January, nor the minima always in August. In ten years the maximum number of fast storms was distributed by months as follows: January, 4; March, 3; December, 2; February, 1; April, 1. The minima came as follows: August, 5; June and April, 2 each; October and November, 1 each.[7]

In order to eliminate the discrepancies caused by the different numbers of days in the different months, each year was divided into 10-day periods, and curves were then drawn for each year and for the average of the ten years.

Fig. 1 shows the depression in February and the increase above the average in September, with a depression in October. Following the mean curve through the whole year, the conditions may thus be summarized: In the first ten days of April the number of fast storms is equal to the average (4.35 in ten days), it is below the average for April, May, June, July, and August, with some slight fluctuations; in the first half of September it rises above the average, falls again, and again rises above the average in the beginning of November, remaining in that relation till the end of March, with a depression in February. There are, therefore, two maxima of occurrence of rapidly-moving cyclones:

1. The primary winter maximum from the first half of November up to the end of March.

2. The secondary autumn maximum in September.

The rapid fall below the average at the end of March and the beginning of April is characteristic of each year, except 1895 and 1898, when there was a delay of one month.

In the MONTHLY WEATHER REVIEW the average velocities of high and low areas are given for each month. The number of half days occupied by the passage across the United States of all the cyclones in each month of the ten years was expressed by 100, and a computation was made as to what percentages of half days belong to the fast storms, and also as to how these percentages are distributed among the storms of different velocities, e. g., 500–600 miles in twelve hours; 600–700 miles in twelve hours, etc. For example: The time occupied in the progression of all cyclones in January, 1893, was 79 half days, in 1894 it was 84 half days, etc. In the ten years, 1893–1902, the time thus occupied in the progression of cyclones in January was 869 half days. Of this number the fast storms took up 234 half days or (234 : 869) 26.9 per cent. This percentage may to some extent serve as an expression of the "storm activity" of the month. Computations of similar nature may be carried out for the length of the tracks of rapidly-moving cyclones in comparison with the length of all cyclonic tracks.

In general, if the half-day storm track be taken as the basis of measurement we note:

1. That one-quarter of our winter cyclones belongs to the "fast-storm" class, the maximum proportion coming in January, and the percentage decreasing toward summer, being 10 per cent in the summer months, with a minimum (7.7 per cent) in August.

2. The percentage in February is smaller than in January and March; there is a high percentage in July (as compared with June and August) and in September, with a decrease in October.

A comparison of the data in Table 2 with the average

[5] Following Loomis.

[6] By "fast storm" is meant a cyclone which moves 500 miles or more in twelve hours.

[7] The year 1902 had two equal maxima and two equal minima.

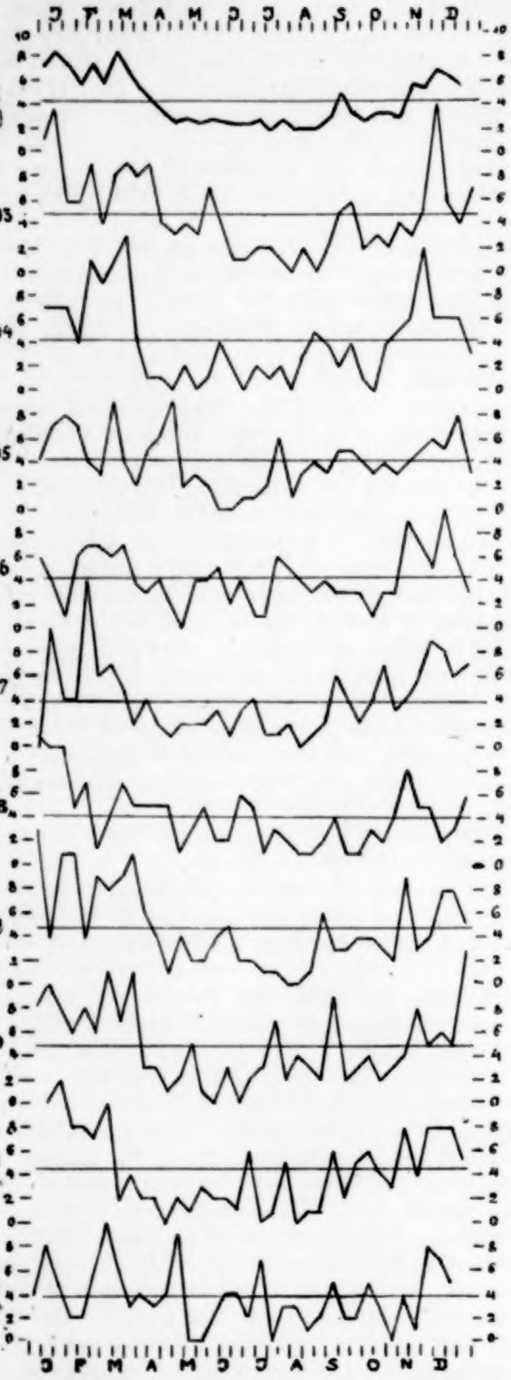

FIG. 1.—Number of rapidly-moving storms in each period from 1893 to 1902, inclusive.

hourly velocities of all storms in each month (last column, Table 2) is interesting, especially in July. As the average hourly velocities do not show the February decrease and the September increase above noted, some explanation of this discrepancy must be sought in the influence of the lows that move less rapidly than 500 miles in twelve hours.

The question arises, How shall these two peculiarities in the yearly distribution of fast storms, viz, the depression in February followed by an increase in March, and the increase in September followed by a decrease in October, be explained? Are these regular features of every year, due to slight but regular more or less marked disturbances in the general circulation, or are they only features of the period under review? The writer offers no answer, but wishes to point out that both of these peculiarities are alike in the following respects: The decrease is followed by an increase in the spring (February, March) and the increase is followed by a decrease in the fall (September, October) and both features occur at the time when the sun is crossing the equator.

TABLE 2.—*Duration of cyclones of different velocities (1893–1902) expressed in percentages of the aggregate duration.*

	Per cent of cyclones. (Velocity less than 500 miles in 12 hours.)	Per cent of cyclones. (Velocity more than 500 miles in 12 hours.)	500-600 miles in 12 hours.	600-700 miles in 12 hours.	700-800 miles in 12 hours.	800-900 miles in 12 hours.	900-1000 miles in 12 hours.	1000-1100 miles in 12 hours.	1100-1200 miles in 12 hours.	1200-1300 miles in 12 hours.	Average hourly velocity of all cyclones.
January	73.1	26.9	11.4	7.6	4.5	2.0	0.9	0.2	0.2	0.2	31.3
February	77.2	22.8	9.5	6.6	3.7	1.3	1.3	0.5	0.1	......	30.4
March	75.8	24.2	11.5	6.4	3.7	1.9	0.5	0.3	0.2	......	29.3
April	87.8	12.2	5.6	4.2	1.6	0.6	0.2	......	......	......	25.0
May	88.9	11.1	5.8	2.5	1.7	0.6	0.1	0.3	......	0.1	23.4
June	89.8	10.2	4.8	2.2	1.6	1.0	0.5	......	......	......	22.5
July	88.7	11.3	4.9	3.5	1.4	1.2	0.3	......	......	......	22.9
August	92.3	7.7	3.5	1.9	1.3	0.6	0.4	0.1	......	......	21.8
September	86.9	13.1	6.1	3.2	2.5	0.8	0.3	0.2	......	......	23.6
October	89.2	10.8	5.3	3.8	1.0	0.5	0.2	......	......	......	24.5
November	81.1	18.9	8.9	6.0	2.8	0.7	0.5	......	......	......	28.9
December	76.1	23.9	8.8	6.4	4.5	2.8	0.8	0.4	0.1	0.1	31.6

After discussing the yearly occurrence of rapidly-moving cyclones, the next question taken up was the geographical distribution of such cyclones and their principal tracks. In studying this subject, a map of the United States was divided by means of parallels and meridians, into 5-degree squares, each square being numbered, beginning with 1 in the extreme northwest and ending at 90 and 91 over Cuba. Fig. 2.

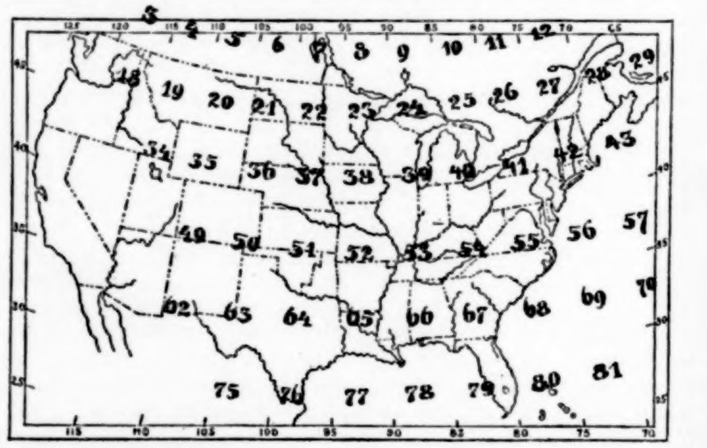

FIG. 2.—Map of the United States, showing system of numbering 5-degree squares.

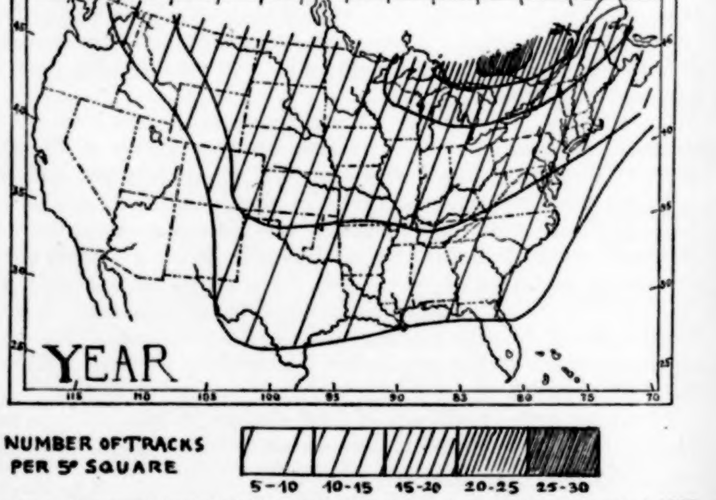

FIG. 3.—Geographical distribution of fast-moving cyclones (period 1893–1902).

In each of these squares was entered the number of all fast storms which passed across that square, and from these data it was possible to see the changes in the numbers of such storms in each square for each month. The fast storms west of the Rocky Mountains were omitted. The geographical distribution of these storms is shown in fig. 3 and in Charts XI and XII and Table 3.

Table 3.—*Numbers of fast storms passed each square in ten years.*

Squares.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
SQUARES 2-14, NORTH LATITUDE 50°-55°, WEST LONGITUDE 60°-125°.												
2	2	5	2	1	0	1	1	0	1	2	4	5
3	8	8	2	5	1	4	2	1	2	5	14	10
4	20	13	6	8	4	3	7	3	8	9	15	17
5	17	12	6	7	5	6	8	5	8	10	17	16
6	18	11	5	5	5	6	11	11	8	12	10	22
7	12	9	8	4	2	10	7	6	8	8	6	19
8	7	2	4	1	3	10	0	3	6	4	7	14
9	3	2	2	1	2	6	2	4	8	3	1	9
10	1	0	2	0	1	3	0	3	2	2	1	1
11	0	0	2	0	0	2	0	2	4	2	4	4
12	1	0	4	0	1	1	2	2	4	1	5	5
13	3	1	4	0	2	1	2	2	6	2	4	4
14	1	1	2	0	0	0	0	0	4	0	2	1
SQUARES 18-30, NORTH LATITUDE 45°-50°, WEST LONGITUDE 55°-120°.												
18	8	9	11	8	3	3	4	0	4	6	10	9
19	15	9	15	8	6	1	7	0	9	7	11	9
20	18	17	21	14	10	6	11	5	16	8	15	15
21	18	15	12	14	12	7	12	8	12	7	15	13
22	18	10	10	7	10	6	16	17	11	10	17	19
23	15	7	7	6	10	11	10	16	14	12	13	21
24	22	11	17	11	15	22	13	15	24	11	15	19
25	22	15	25	11	14	25	18	9	24	13	23	24
26	28	19	30	14	16	20	20	11	24	19	30	24
27	34	20	25	17	13	16	14	6	23	18	32	21
28	30	17	25	15	9	5	7	8	20	13	24	24
29	21	16	23	11	1	2	2	3	13	8	12	17
30	13	10	11	5	0	0	0	1	9	5	4	14
SQUARES 34-45, NORTH LATITUDE 40°-45°, WEST LONGITUDE 55°-115°.												
34	5	7	4	4	3	3	2	1	3	1	1	2
35	11	9	16	7	3	4	1	5	8	1	7	9
36	12	15	16	8	10	6	6	8	12	9	17	18
37	18	10	14	5	5	9	10	16	14	6	16	12
38	20	8	11	4	9	6	16	13	10	3	13	14
39	15	15	14	5	7	4	14	5	6	3	16	8
40	28	23	23	4	9	7	8	2	7	4	18	18
41	35	17	19	4	5	4	5	3	3	4	17	22
42	32	18	27	3	3	1	3	1	8	7	10	22
43	31	20	21	4	1	3	2	1	6	5	11	19
44	15	17	11	2	0	1	2	0	3	4	3	13
45	4	4	5	0	0	0	0	0	0	1	1	5
SQUARES 49-58, NORTH LATITUDE 35°-40°, WEST LONGITUDE 60°-110°.												
49	4	7	7	1	3	1	0	1	3	0	3	5
50	11	20	16	16	9	3	2	3	6	2	10	11
51	13	11	22	5	5	3	9	9	4	2	9	11
52	15	10	20	4	7	2	4	3	0	4	10	13
53	17	16	21	10	5	2	1	1	3	3	9	20
54	16	17	21	5	4	1	0	1	3	2	3	19
55	20	14	14	9	6	1	0	1	4	5	4	17
56	18	8	12	3	1	2	0	0	3	5	3	8
57	9	3	4	0	0	1	0	0	1	1	0	1
58	1	0	1	3	0	0	0	0	0	0	0	0
SQUARES 62-70, NORTH LATITUDE 30°-35°, WEST LONGITUDE 65°-110°.												
62	7	5	3	4	3	0	0	0	0	0	2	2
63	10	9	7	5	4	0	0	0	1	0	7	8
64	10	13	9	5	4	1	0	1	0	4	8	14
65	12	18	12	5	4	2	0	1	3	5	5	16
66	14	15	10	5	4	1	0	0	2	1	4	10
67	12	15	15	4	5	0	0	0	3	3	1	6
68	10	9	10	1	4	0	0	0	4	4	1	9
69	4	3	4	0	1	0	0	0	0	0	0	4
70	1	2	2	0	1	0	0	0	1	1	0	4
SQUARES 75-81, NORTH LATITUDE 25°-30°, WEST LONGITUDE 70°-105°.												
75	3	3	1	0	0	0	0	0	0	0	1	1
76	10	10	5	4	0	1	0	0	0	3	2	11
77	3	9	4	2	0	1	0	0	1	1	0	7
78	1	6	3	0	0	0	0	0	0	0	0	3
79	2	2	3	0	0	0	0	0	0	1	0	2
80	9	1	2	0	0	0	0	0	0	0	0	2
81	0	0	1	0	0	0	0	0	0	0	0	1

The data for the 10-year period here considered are not regarded as giving a satisfactory view of the geographical distribution and of the principal tracks of fast storms during the summer half-year, because of the small number of such storms at that season. For the winter half-year, however, the conditions are much more satisfactory, especially as regards the principal tracks, in drawing which the author has made use of maps that he has constructed, showing for each month the tracks of all fast storms during the 10-year period. (These monthly track charts of rapidly-moving cyclones are not here reproduced.) If these small charts are examined it will be seen that they may be classified into two groups:

1. Those with northern circuit track (figs. 4, 5, 6, 7, 8, 9, Chart XI).

2. Those with northern and southern circuit tracks (figs. 10, 11, 12, 13, 14, 15, Chart XII).

In the first group the maps are much alike. The main track, with its maximum number of fast storms in the Lake Superior region, in Ontario, and in Quebec, reaches as far south as latitude 45° north in May, June, and October, and to latitude 40° north in July, August, and September, forming a loop over the upper Mississippi and Missouri region. The change in the track from September to October and from October to November is notable.

In November the southern circuit begins to be established. This reaches to between latitudes 35° and 40° north, and the eastern part of the southern circuit crossing the Lake region keeps rather to the Canadian side, trending in an east-northeast direction. There is a remarkable decrease in the occurrence of rapidly-moving cyclones in the upper Mississippi region, which continues until March, and is even faintly seen in April.

In December the conditions become more exaggerated. The southern circuit reaches as far as latitude 35° north, and while trending east-northeast it is joined by minor tracks from the Gulf and South Atlantic States. The southern-circuit track goes along shore, off New England, while the northern circuit keeps on the Canadian side.

January, with its maximum number of fast storms, is much like November. The western branch of the southern circuit is broad, and is clearly separated from the western part of the northern circuit. These both join in the east, passing over the Northeastern States, which are in this month a region of fairly uniform distribution of fast-storm frequency.

In February the western branch of the southern circuit comes pretty nearly from the north; the eastern branch splits into two tracks to the south of the Lakes, the northern one of these two joining the northern circuit, while the southern joins the Atlantic track coming along the coast from the Southern States.

The main tracks in March are similar to those in February, with the exception that the southern circuit does not reach as far south as in February and splits somewhat sooner. The eastern portion of the northern circuit is very marked in Canada.

With April, the transition month, the eastern part of the southern circuit breaks; there are some breaks in the western and eastern portion of the southern circuit and in the Canadian portion of the northern circuit. In April, the summer half-year circulation, which is confined to the northern circuit, begins again.[8]

All the maps from November to March, inclusive, have two features in common, viz, the relatively infrequent occurrence of fast storms in the district between the Missouri and Great Lakes, and the splitting of the southern circuit into two branches, one of which crosses over to Canada, and the other of which passes off-shore along the New England coast. The explanation of these two features is to be found in the occur-

[8] The author wishes here to call the attention of the reader to what Prof. F. H. Bigelow says regarding storm tracks and their changes from month to month in Weather Bureau Bulletin No. 20, Storms, Storm Tracks, and Weather Forecasting.

rence of the Central States and the St. Lawrence highs, and in the different velocities of lows and highs.

If a storm which, because of its energy, form, or gradients, is adapted for a very rapid progression, comes up against the rear of a high which lies in its path, the velocity of the low is checked somewhat, but the storm at last finds its way around the high to the right or to the left of the center. A measure of the retarding effect of highs seems to be found in the difference of the velocities of lows and highs; if the velocities are equal, there is neither retardation nor deflection.

The retarding or deflecting effect increases with an increasing velocity of the low or a decreasing velocity of the high. It would suffice for the present purpose to give the differences between the velocities of rapidly-moving lows and the highs which retard them for each month over the Great Plains and the Northeastern States; but not having measured the velocities of the high areas in the regions named, the writer has been obliged to content himself with the average velocities of all lows and highs. These data are given below (Table 4) and

Table 4.—*Average velocities (in miles per hour) of all highs and lows.*

	November.	December.	January.	February.	March.
Lows	28.9	31.6	31.3	30.4	29.3
Highs	26.0	25.5	29.6	26.0	25.8
Difference, low – high.	+ 2.9	+ 6.1	+ 1.7	+ 4.4	+ 3.5

furnish a satisfactory explanation of the influence of the St. Lawrence high. To this question regarding the St. Lawrence high further discussion will later be directed, but attention may here be called to the fact that the retarding effect of highs on lows is greatest in December and least in January.

In the study of the fast storms which follow the western part of the southern circuit, there have been collected from the author's monthly track charts above mentioned all tracks that had an azimuth between south-southwest and southeast. In each of these cases sketch-maps were drawn, showing the general distribution of pressure over the United States as indicated on the Washington weather maps. It was found that the fast storms passing southward along the eastern base of the Rocky Mountains are in general under the influence of high pressure belts, which may be classified as follows:

1. High pressure in the central region.
2. High pressure on the Pacific coast or Rocky Mountain Plateau.
3. High pressure in Alberta.

The effect of conditions 2 and 3 is to accelerate the progression of the low, while a high area in the central region retards the advance of the storm and causes its deflection to the south. This last-mentioned high (1) is the most important of the three, and the maps on which these conditions of pressure prevailed were divided into four pressure-type groups, viz:

(*a*) The eastern high has its maximum pressure in the Lake region, and its isobars form ellipsoidal loops far south to the Gulf States.

(*b*) The eastern high has its maximum pressure in the South-central, Eastern, Gulf, or South Atlantic States.

(*c*) The link type between 1 and 2, where two highs, one in the Lake region and the other in the south, together form a "saddle."

(*d*) Scattering cases, which are too complex to be classed in any of the three preceding groups, but resemble type 2.

After completing the foregoing classification the writer had access to Professor Bigelow's Storms, Storm Tracks, and Weather Forecasting and found that the types *a* and *b* correspond to the high areas accompanying Professor Bigelow's North Pacific type[9] and Alberta type[10] (page 35). The "saddle" type, usually a transition type, frequently changes into type *a* or *b*, so that the high pressure in the south or north disappears. Thus it appears that the fast storms that move south along the eastern Rocky Mountain slope over the Great Plains are controlled in their path by the highs of the North Pacific and Alberta types.

The detailed study of the influence of the St. Lawrence high upon the rapidly-moving storms of the southern circuit is to form the second division of this investigation. At present the following facts can be stated:

In November there is no splitting of the track, because the southern circuit does not reach far south and, therefore, all fast storms pass the St. Lawrence high, leaving it to the right.

In December the majority of the fast storms of the southern circuit pass the St. Lawrence high in such a way that they leave it on their left.

About January, as was stated above, the fast storms pass with a fairly evenly distributed frequency over the Northeastern States, and it may be due to this fact that the lows and highs do not differ much in velocity (see Table 4). In this month some of the fast storms, especially those from the northern circuit, cross the main broad track in New England nearly at right angles, showing very distinctly the deflecting influence of the St. Lawrence high.

In February and March, when the southern circuit shifts northward, the influence of the St. Lawrence high is very marked in deflecting the path of fast storms. "Special attention," as Professor Bigelow points out, "should be directed to the probable behavior of the St. Lawrence high, as upon this will depend success in forecasting the advance of large storms from the southwest."

The following table (5) shows the number of fast storms which passed over the Northeastern States (5-degree squares Nos. 25, 26, 27, 40, 41, 42) and it will be seen that there is a marked falling off in square 41 (New York and Pennsylvania) in the months of February and March, thus distinctly showing the influence of the St. Lawrence high. The 5-degree squares are naturally too large and give too general a view. One-degree squares would bring out the contrasts much more sharpely:

Table 5.—*Number of fast storms passing over the Northeastern States.*

	25	26	27	40	41	42
December	2.4	2.4	2.1	1.8	2.2	2.2
January	2.2	2.8	3.4	2.8	3.5	3.2
February	1.5	1.9	2.0	2.3	1.7	1.8
March	2.5	3.0	2.5	2.3	1.9	2.7

The data used in tracing the frequency of fast storms were also used in determining the average hourly velocities of fast storms in each square. The sum of all velocities marked in each square was divided by twelve times the number of fast storms which passed across the square. This was done for the autumn and winter months (November to March), omitting States west of the Rocky Mountains. The averages are given in Table 6.

These numbers do not, of course, give the velocity of storms along the main tracks which are above drawn, but average velocity of storms along all tracks which crossed each square in any direction. The true velocity for each track might be

[9] The North Pacific type.—"These (storms) come in over the extreme northern coast, near Vancouver, and separate about equally in numbers into two paths, of which the first is directly eastward over the Lakes and the second far to the southeastward along the mountain slope, generally reaching northern Texas. In this case a high covers the central valleys and the Missouri Valley, the weight of it being near the northern boundary, whereas in the Alberta type it is heaviest in the Gulf States."

[10] The Alberta type.—"When a low forms in the extreme northwest it is generally found that another low covers the Gulf of St. Lawrence and that an extensive high area occupies the central valleys and the Gulf States * * *. About one-third of the storm centers will be deflected into the southern course and these are much more erratic in their action and harder to forecast."

obtained by taking the cosine of angle between the direction of average main track and the direction of any fast storm in each square. This would obviously be a very laborious piece of work when the number of fast storms and of the squares is recalled.

TABLE 6.—*Average hourly velocity (in miles per hour) of fast storms in each 5-degree square.*

Square No.	November.	December.	January.	February.	March.	Square No.	November.	December.	January.	February.	March.
2	47.9	52.3	49.2	49.2	58.7	40	55.0	62.5	59.6	56.5	55.2
3	49.6	50.5	58.2	53.1	59.6	41	54.9	55.6	56.5	55.7	57.5
4	50.5	48.9	53.2	51.1	65.2	42	51.8	57.2	57.5	52.3	57.5
5	52.6	52.9	52.8	53.1	66.9	43	50.6	59.4	59.2	55.2	56.0
6	54.2	56.1	53.3	53.6	53.3	44	50.5	58.9	61.1	57.2	53.5
7	53.6	57.8	55.6	50.9	47.3	45	43.7	53.2	59.2	54.2	56.1
8	53.0	56.3	57.2	45.0	46.2						
9	50.0	59.1	65.6	45.2	54.6	49	48.6	60.3	58.2	57.0	54.7
10	51.7	60.4	74.5	......	......	50	49.9	58.6	56.0	56.9	52.4
11	54.2	65.0	......	......	55.6	51	53.3	58.1	56.7	52.5	51.8
12	52.5	61.3	41.7	......	55.2	52	51.2	61.3	54.5	51.9	52.7
13	47.5	57.5	58.7	49.6	58.3	53	52.1	57.2	52.3	57.5	55.2
14	44.2	54.2	45.0	62.9	50.2	54	56.5	56.9	57.0	61.9	57.8
						55	54.0	51.6	58.4	54.1	61.8
18	57.5	61.5	53.2	60.3	54.8	56	55.4	55.2	57.7	59.5	58.9
19	60.0	59.6	57.4	57.7	54.3	57	......	63.3	62.2	65.5	48.5
20	57.8	62.5	61.0	58.1	61.6	58	......	......	63.7	......	50.4
21	55.6	58.7	57.8	62.4	60.1						
22	54.6	55.8	54.1	59.6	55.2	62	51.4	57.7	53.7	61.7	61.1
23	55.7	56.5	53.0	53.6	51.6	63	51.3	55.5	52.9	61.9	58.0
24	53.9	58.6	56.3	57.5	51.8	64	49.2	57.6	52.3	59.1	57.2
25	52.7	59.5	57.8	52.7	53.9	65	51.3	61.2	59.5	57.7	58.2
26	54.2	57.9	54.5	55.5	52.4	66	53.6	62.3	65.2	60.9	55.0
27	53.6	53.4	56.4	54.8	52.5	67	46.7	50.5	64.8	64.8	55.5
28	53.2	54.2	56.2	51.3	52.2	68	47.9	53.8	61.5	56.6	53.2
29	51.0	54.6	52.1	53.2	52.7	69	......	57.5	50.2	59.2	50.8
30	52.5	54.8	55.3	54.0	51.2	70	......	70.6	55.0	58.8	64.2
34	63.7	73.3	59.8	59.2	57.4	75	55.4	51.2	51.6	63.5	68.3
35	56.3	64.9	60.4	60.7	56.7	76	50.2	58.4	57.4	53.9	55.0
36	56.2	58.2	62.5	59.5	57.6	77	......	60.1	60.8	54.1	52.6
37	55.3	58.0	58.9	59.1	51.2	78	......	62.4	59.1	56.8	53.9
38	54.5	59.1	52.8	61.9	52.7	79	......	75.9	59.0	56.6	44.2
39	53.1	63.6	55.7	57.6	57.4	80	......	83.1	......	49.2	69.5
						81	......	78.7	......	......	84.2

The common features of these sketch-maps, on which have been drawn the lines of 50, 55, and 60 miles per hour, are as follows (see Chart XIII):

1. The high velocities (over 60 miles an hour) in the West along the Rocky Mountains.

2. The high velocities (over 60 miles an hour) along the Atlantic coast and also offshore.

In the second case, the high velocities in the east of storms of the southern circuit progressing northeast come in November in the Lake region when the storms cross over to the Canadian side. December is similar to November, except that in the case of the southern circuit a branch track from the Gulf States, with high velocities, joins it, and on the average all velocities are increased 5 miles an hour as compared with November. In January the highest velocities are in the Gulf States and offshore, over the Atlantic, these being due to storms from the western Gulf and South Atlantic States, which enter the branch of the southern circuit trending northeast.

The February map looks somewhat confused, but there seems to be a tendency to return to the distribution of velocities noted in December. The velocities in the Southeastern States are high, but they are lower where the track divides. In March the velocities in the West decrease, the highest velocities are over the Atlantic, where the right-hand branch of the divided southern circuit meets the storms coming from the Gulf and South Atlantic.

It is noticeable that in the months of December to March, in which the eastern portion of the southern circuit divides, the average velocity of fast storms along the right-hand, off, or alongshore track, is greater than that of the left-hand, continental track. An obvious explanation is that the storms offshore move with much less friction over the ocean surface.

In Table 7 are compared the average velocities of the left-hand, or Canadian branch (represented in squares 26, 27, 28) and those of the right-hand or alongshore branch (represented in squares 41, 42, 43) with the differences between these velocities. In all but two cases the differences are positive, which confirms the greater velocity of the alongshore track. The differences would be more striking if smaller squares had been taken. A similar attempt was made in the case of the summer half-year, but was unsuccessful. Data for twenty to thirty years would be necessary in order to give an idea of the distribution of the average velocities in summer.

TABLE 7.—*Comparison of average velocities (in miles per hour) of storms along the two branches of the southern circuit.*

[Squares 26, 27, 28, represent the left-hand or Canadian branch; squares 41, 42, 43, the right-hand or alongshore branch.]

Squares No.	December.	January.	February.	March.
41	55.6	56.5	55.7	57.5
26	57.9	54.5	55.5	52.4
Difference (41—26)	— 2.3	+ 2.0	+ 0.2	+ 5.1
42	57.2	57.5	52.3	57.5
27	53.4	56.4	54.8	52.5
Difference (42—27)	+ 3.8	+ 1.1	— 2.5	+ 5.0
43	59.4	59.2	55.2	56.0
28	54.2	56.2	51.3	52.2
Difference (43—28)	+ 5.2	+ 3.0	+ 3.9	+ 3.8

THE UNUSUAL RAINFALL OF FEBRUARY AT HONOLULU.

By R. C. LYDECKER, Territorial Meteorologist. Dated March 17, 1904.

The rainfall for February was from four to five times the normal, which is given as 5.6 inches. The average rainfall reported last month was 24.87 inches. According to the monthly summary, Oahu suffered the most in the storms; Maunawili, on this island, reported a fall of 44.65 inches, while in twenty-four hours at the same place 12.50 inches of rain fell. Hawaii suffered the least of any of the islands in the storm, though the big island is usually well to the front in the rain records.

I inclose a barograph sheet (fig. 1) showing the fluctuation of the barometer at Honolulu during the week of heaviest rainfall. The previous records of lower pressure than is shown on this sheet (29.59 on the 11th) are as follows: January 28, 1881, 29.40; February 5, 1901, 29.49; February 13, 1891, 29.57; November 15, 1900, 29.58; February 11, 1904, 29.59.

On this island the rainfall record of 44.25 inches at Luakaha, March, 1902, was broken by a fall of 44.65 at Maunawili. There was no warning of the storm's approach, which set in on the afternoon of the 6th, and between 3 p. m. of that date and 9 a. m. of the 7th 6.22 inches fell at the Weather Bureau. On the 15th there was every indication of this storm passing away, but these indications suddenly ceased, and those of storm No. 2 appeared, which followed closely. It might be said that No. 2 dovetailed into No. 1. During the greater part of these storms calms and light winds prevailed, as noted on the records of observations.

Our heavy rainfalls heretofore have always followed several months of pressure below the normal, and this is the first time that the contrary has been the case since this office was established. It was with this fact in view that, in my summary for November, 1903, I said: "The barometric average for the past five months has been slightly above the normal, a condition likely to be followed by a winter of moderate rainfall," the authority for the statement being the records of this office. Mr. Lyons tells me that in all his experience he has never known a like condition.

The accompanying barogram, from noon of February 8 to noon February 15, shows that during the first three days there

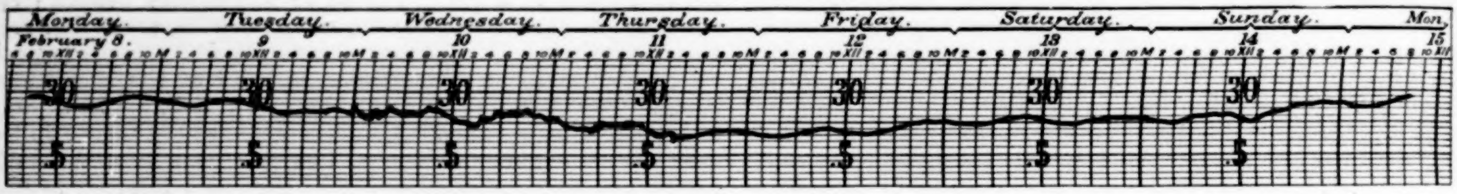

FIG. 1.

was a steady, slow fall of barometric pressure, amounting to 0.25 inch, if we compare only the readings at 9 a. m. During the last three days pressure rose slowly by 0.26 inch from 9 a. m. of the 12th to the 15th. It does not necessarily follow that Honolulu was on the outskirts of a moving hurricane or typhoon. To decide that question, one must have the wind records. It is equally possible that we here have to do with a slow oscillation of the location of the general area of tropical high pressure northeast of Honolulu or of equatorial low pressure south of Honolulu. Evidently the word "storms," as used by Mr. Lydecker, refers only to rainfall, as there was neither high wind nor rapid changes in barometric pressure. There can hardly be any doubt but that under these circumstances the rainfall represents the result of changes going on in wind, moisture, and temperature in the cloudy layer and the higher regions of the atmosphere; changes that are due to slight and widespread changes in atmospheric pressure. Similar changes occur within the regions of our own daily weather maps. A fall of a tenth of an inch in pressure, or less, in the equatorial regions, as shown by reports from Colon, the West Indies, or Mexico, is likely to be at once followed by a cold wave spreading from Canada southward over the Valley of the Mississippi. Before the front of the cold wave reaches the Gulf of Mexico rain and snow are likely to occur, and as soon as it reaches the warm waters of the Gulf they are certain to occur. The atmosphere is so mobile, or, in other words, viscosity is so small a factor, that slight gradients of pressure, not always recognizable on our present meteorological maps, quickly set it in motion. The resistances introduced by the irregularities of the ground may require a slight additional gradient to overcome them, but in a general way the progress of a cold wave toward the Gulf of Mexico, like the progress of the great monsoon wind from the southern Indian Ocean across the equator to the shores of Hindostan, is maintained by a slight gradient entirely different from the steep gradients that prevail within a whirlwind. Therefore it is that a fall of a tenth of an inch in twenty-four hours is an important matter and almost certainly a forerunner of rain in India, the West Indies, Honolulu, and the Philippines. These all represent moist climates at about 20° north latitude, where the ascent of the air to the extent of a few thousand feet cools it sufficiently to produce cloud and rain.

Those who wish to make a minute study of the fluctuations shown on the accompanying facsimile of the Honolulu barogram (fig. 1) may correct it for slight deviations from the readings of the standard mercurial barometer by means of the following table of corrections furnished by Mr. Lydecker:

Time.*	Standard pressure.†	Correction to barogram.‡
February 8, 9 a. m....	29.95	0.00
February 9, 9 a. m.....	29.93	0.00
February 10, 9 a. m.....	29.83	−0.03
February 11, 9 a. m.....	29.70	−0.04
February 12, 9 a. m.....	29.68	−0.02
February 13, 9 a. m.....	29.77	−0.01
February 14, 9 a. m.....	29.79	−0.01
February 15, 9 a. m.....	29.94	0.00

* Honolulu date and standard time, 157° 30′. † Reading of standard mercurial barometer at 9 a. m., reduced to standard temperature, sea level, and gravity. ‡ Correction to be applied to the readings of the barometer in order to obtain standard pressures.

C. A.

DUST IN THE ATMOSPHERE DURING 1902-3.

By ANDREW NOBLE, Esq., Rozelle, Sydney, N. S. W. Dated July 16, 1904.

I have been much interested in the recent notices that have appeared relative to a diminution in the transparency of the earth's atmosphere during 1902-3, and more particularly in the article that appeared at page 111 of the MONTHLY WEATHER REVIEW for March, 1904, and, in response to the request of the Editor, published in Nature, vol. 70, May 19, 1904, at page 60, I have gone through my notes and scrapbook in order to collect any matter that may be of service to him. Duststorms were characteristic of the late 9-years' drought in Australia, especially during the latter stages. It is difficult to give an adequate idea of the effect produced by these dust or sand storms. The soil, made loose and friable by the prolonged absence of rain, no longer able to withstand the wind, was swirled up and carried across country with resistless force. In many cases it was torn up to a depth of one foot, or down to solid clay. On a station in the Wileaunia district 100,000 acres were left as bare as a floor, upon which a heavy rain that followed had no effect. In one case 12 feet of sand were deposited in a bank in three months. Wherever a little resistance offered, the sand accumulated, and eventually formed a dune. Wire-netted rabbit-proof fences were buried in this way, and even a second story to the fence shared a similar fate. On the Albemarle station (latitude 32° 13′, longitude 142° 40′) a 7-foot stock yard fence was so completely submerged within eighteen months of erection that the owner drove over it in his buggy. Numerous instances are given of daylight becoming completely obscured during the progress of these storms, and, in consequence, lamps had to be lit. All traffic stopped; people lost their way, not being able to see their hands when held up before their faces; and fowls went to roost in the daytime. Although intermittent during the winter months of 1902, these storms renewed their activity much earlier than usual during the following spring. Early in September, 1902, the ship *Wakatipu* encountered in Bass Straits a rain squall accompanied by a "fall of fine chocolate mud." The wind was west-southwest at the time. The early return of these storms during 1902 was undoubtedly due to the intensified character of the drought in central Australia during the antecedent six months. Referring to this period, Sir Charles Todd writes:

During the past winter the six months rainfall (April to September) at 37 selected stations in South Australia is, without exception, far below the average amount. It is, in fact, one of the driest years ever experienced. So far as all the northern areas are concerned, it is the driest, and the same applies to many parts of the south. At 24 out of 37 stations the winter of 1902 is the driest on record, while at 8 others only one other year was drier.

It is in this part of Australia that our duststorms have their origin. Sturt, the explorer, in his diary writes:

North and northwest of Flinders Range are large plains, extending as far as latitude 25°. To the north of that latitude, though the sun was intensly hot, there were no hot winds; in fact from that parallel of latitude to the Indian Ocean, either going or coming, they were not met with. On reaching latitude 27° on my return, I found the hot winds prevailing again, as on my outward journey. I saw no sandy desert, to which these hot winds had been attributed, but on lifting some of the stones that were lying on the surface I found them so hot that I was obliged to drop them immediately. It is my opinion that when a hot wind blows across these stone-covered plains it collects the heat from them, and the air becoming rarified is driven on southward with increased vehemence.

Mr. Auld, in the Adelaide Advertiser, of December 20, 1862, confirms this experience, and writes:

The hottest weather experienced by the exploration party was within or near the boundaries of South Australia, and they never experienced a hot wind in the interior.

Following the unprecedentedly dry winter of 1902, these storms became more pronounced during the spring months, and continued with varying intensity according as the wind circulation of passing atmospheric depressions favored their formation and distribution. They undoubtedly attained their culmination in the great storm of November 11 to 13, 1902. This storm assumed a phenomenal character, especially in South Australia, Queensland, New South Wales, and Victoria. In the latter State the effect was extraordinary on the 12th, the majority of stations reporting gales of dust accompanied by lightning, balls of fire, and darkness in the daytime so intense that fowls went to roost in the afternoon, while people had to find their way about by the aid of lanterns. The ship *Airlie*, en route from Brisbane to Sydney, 13th to 15th of November, encountered a duststorm, the dust covering the ship from end to end. Several passing vessels experienced showers of the so-called red rain. Mr. H. Stuart Dove, of West Devonport, Tasmania, writes:

On November 12 I noticed that the sky to the north and northeast, from horizon halfway up to zenith, had assumed an extraordinary chocolate-brown tint, due to clouds of that color which were moving toward us from the northwest. Under these clouds and moving from the northeast were ashy-gray patches of strata, streaked with fantastic dark lines resembling bows and boomerangs. A few drops of rain which fell about 5 p. m. were charged with brown, earthy matter, and at 6 p. m. a paper which was held in the rain became spotted all over with blotches. At 6:20 p. m. the solid matter was still descending, but in less quantity. At 6:30 there was a marked diminution, and by 6:50 p. m. the rain was all but free from it.

In Nature, Vol. LXVIII, July, 1903, p. 223, P. Marshall, of Otago University, New Zealand, supplies an interesting account of a heavy dust fall and storms in various parts of that colony on November 14 and 15, which, he states, were not due to local causes, and he shows by microscopical and chemical examination of the dust and by the distribution of atmospheric pressure and resultant winds between Australia and New Zealand that the dust was probably transported from Australia over the 1200 miles of intervening ocean.

On November 15, 1902, Mr. Langdon, superintendent of the Eastern Extension Telegraph Company, Port Darwin, Australia, received the following cablegram from Banjoewangie:

Very hazy last few days; temperature high; wind variable from south to northwest. Sourabaya papers last week reported a heavy haze in the Java Sea, lying low on the water, supposed to be due to volcanic dust from Martinique. No eruption in Java, but on the 12th, between 4:30 and 5 p. m. (local time), a short, heavy shock of earthquake was felt at Zoenadjang, Malay, and Banjoewangie, direction east to west, attributed to the Sinero.

On November 17, 1902, the postmaster at Port Darwin sent the following message to Sir Charles Todd:

Color of haze or smoke, bluish gray. Slight shower of rain on 15th. Blaeser, of this department, took a clean sheet of glass and exposed it to the rain, allowing the rain water from the glass to run into a small, clean bottle. The rain water in bottle contains sediment of light, fluffy dust; color, gray. Haze very prevalent yesterday; also continues to-day, but not so dense as on Friday (i. e., 14th).

Captain Dabelle, of the steamer *Guthrie*, upon arrival at Port Darwin on November 16, 1902, reported that the steamer was delayed by difficulty in picking up the land, owing to the prevalence of the smoke which was encountered all the way between the Philippine Islands and Australia. The captain said that the smoke was unlike that from bush fires. On November 16 it was so thick that the bold headlands on North Australia at a distance of one mile were completely obscured. The haze could be plainly seen between clumps of trees, houses, and other objects less than 200 yards away.

Capt. C. Lindburgh, of the steamer *Tsinan*, upon arrival at Port Darwin on November 24, 1902, supplied extracts from the ship's log during the last voyage northward from Port Darwin to Honkong, and on his return passage from Hongkong to Port Darwin again. These show that a thick haze was experienced from October 17 to 21. During this time the officers never saw land and had trouble in getting observations. The captain reported the hazy weather on arrival at Hongkong, where it was supposed to be caused by volcanoes in Sumatra. It lasted from latitude 8° 16′ south, longitude 129° east, to latitude 6° 34′ north, longitude 123° 22′ east. The barometer ranged from 30.14 to 30.00. On his return trip the haze commenced in latitude 1° 18′ south, longitude 125° 27′ east, and lasted until arrival in port. The phenomenon was generally considered to be due to volcanic disturbances.

The above notes show that the duststorm of November 11 to 13, 1902, involved the greater part of Australia and the surrounding ocean, at least as far as New Zealand. From this epoch they gradually lost their intensity and general character, at least so far as the whole of Australia is concerned, although they continued to be severe over interior parts of New South Wales up to the spring of 1903. They probably received a check by the widespread and useful rains which fell during the middle of February, 1903. These were largely due to an antarctic disturbance, and they spread over central Australia and the whole of Victoria, the falls registered ranging up to over two inches. This disturbance brought abnormally cold conditions for the time of the year. In Adelaide the 14th was, with one exception, the coldest day ever experienced in February, the maximum shade temperature being 64.8°. On February 19, 1883, it was one degree lower. A heavy fall of snow took place at Kiandra, N. S. W., on February 15, accompanied by a high wind from northwest, the temperature falling to 35°.

STORM OF AUGUST 20, 1904, IN MINNESOTA.

By T. S. Outram, Local Forecaster, Minneapolis, Minn.

In Minneapolis, on the day in question, the sky was cloudy from about 8 a. m. until 5 p. m., when it cleared; but before 7 p. m. it clouded up again rapidly from the south with clouds which seemed at first to be somewhat high. These clouds had a rather greenish-yellow cast, and soon after 8 p. m. the whole sky was overcast and very stormy looking, a few persons saying that they saw many clouds of a pendulous shape, though no one has reported seeing anything that in any way resembled a tornado funnel. Light rain fell at intervals from 8:25 to 9:11 p. m., when it became excessive. During the period of excessive rainfall—from 9:11 to 9:56 p. m.—1.10 inches were recorded. It is not possible that the gage could have received the total amount of rainfall, as the sheets of rain, driven by the gale, must have fallen in a direction almost parallel with the top of the gage. Torrents of rain filled the streets with floods of water from curb to curb to a depth of 6 inches for probably ten minutes on grades which were steep enough to carry the water with a rapid current. At the station there were a few small hailstones for a minute or so, shortly before the heavy rain began, but in other parts of the city and in some parts of the country the fall of hail is said to have been heavy.

The self-register at the station shows the wind direction to have been north and northwest after noon; at 1:15 p. m. it became northeast; at 2:40 p. m., east; at 9:15 p. m., northeast; at 9:35 p. m., east; at 9:38 p. m., west; at 9:39 p. m., southeast; at 9:44 p. m., northeast; at 9:45 p. m., north; at 9:46 p. m., northwest; at 10:05 p. m., north; at 10:17 p. m., northeast; after which time the velocity was reduced to fresh. The velocities recorded by the anemometer were as follows: After about 3 p. m. the velocity was fresh; from 9:35 to 9:40 p. m. it was 45 miles per hour; from 9:40 to 9:45 p. m. it was 60 miles per hour; from 9:45 to 9:50 p. m. it was 84 miles per hour, with an extreme velocity of 110 miles per hour about

9:45 p. m. The barograph trace shows that after noon the pressure gradually fell from 28.82 inches to 28.67. Just about the time of the greatest severity of the storm the barograph pen dropped with great rapidity to 28.25, returning immediately and rising to 28.80, then dropping back quickly to 28.70, after which there was a slight fall until about 5 a. m. the next day. Two reliable gentlemen living near the residence of Hon. W. D. Washburn, which was near the center of the wide path of greatest damage, were watching an aneroid barometer at the time of the storm, and they state that the needle went down to 23 inches and returned almost immediately to near its former reading. This aneroid had been compared at this station not very long before the storm and found correct. Even allowing considerable for error because of a possible momentum gained by the needle, the reading was a remarkably low one.

The humidity at the 8 p. m. observation was 80 per cent; late in the afternoon, and early in the evening a number of persons made remarks about the "close" or "sultry" condition of the air.

The storm entered Minneapolis in the vicinity of Lake Calhoun, and from there it passed rapidly northeastward across the southern and south-central portions of the city to beyond the Mississippi River near Tenth avenue south. In nearly all the region mentioned very great damage was done to plate glass, chimneys, roofs, church steeples, telephone and telegraph poles and wires, and to thousands of very valuable shade trees. The Northwestern Telephone Company had over 7000 telephones rendered useless by the storm, and their poles and wires were in such condition that more than a week elapsed before all their telephones were in working order again.

While the barometer readings show undoubted evidence of the close proximity of a tornado funnel, the damage done shows, with a few exceptions, the effect of a straight blow of hurricane force. The trees, roofs, chimneys, steeples, and poles were thrown in nearly all cases toward the east or northeast, and it is probable that the damage occurred at the time of the shift of the wind just after the passage of the elevated tornado funnel. A few trees indicate by the different directions in which their branches were blown something of the effect of a whirl, but there was none of the rending, tearing, complete destruction, and utter confusion in the city such as accompanies the touching of the tornado funnel to the earth. It is possible that in at least two of the high buildings there was something of the explosive effect of the true tornado, as in the Guaranty Building and in Donaldson's Glass Block the large skylights seem to have been lifted sufficiently by an upward rush of air to raise the heavy glass from its fastenings, after which it fell back through the light wells to the floors below; very little, if any, of this glass was carried sideways by the force of the gale. Some of the plate glass, too, fell on the outsides of the buildings.

It is probably safe to say that the amount of damage by the storm in this city aggregated over $500,000, not counting the damage to the trees, which can not be estimated in money.

The severity of the storm was not the same in all parts of the storm-stricken region, but it would be impossible to say that there were any well-defined paths of destruction.

A telegraph operator was killed by lightning while at work in a part of the city not in the affected portion, but there were no deaths due to the storm, though a number were injured, and many had narrow escapes.

Carefully compiled newspaper reports indicate that the storm was first felt in northeastern South Dakota, in the vicinity of Aberdeen, shortly after 6 p. m., and that it moved eastward parallel with the line of the Hastings and Dakota Division of the Chicago, Milwaukee, and St. Paul Railway, and a short distance north of it. No serious damage seems to have been done in Minnesota until the storm reached Renville County, but from Renville County eastward through McLeod, Carver, Hennepin, Ramsey, and Washington counties, and thence into Wisconsin great damage occurred.

In McLeod County the path of destruction extended all the way across the county from west to east, with an area of 10 miles long by 1 mile wide, in which almost everything was entirely destroyed, including residences, farm buildings, stacked and shocked grain, trees, standing crops, and some cattle and horses, with a loss of 4 lives at or near Glencoe.

In Carver County, the greatest destruction was at Waconia, where the storm struck and destroyed the entire center of the village, killing 4 persons. At this point the fury of the storm resembled that of a tornado more than at any point east of McLeod County. The destruction extended east and west of Waconia about four miles in each direction. In Hennepin County, outside of Minneapolis, there was very great damage to residences, stores, and large manufacturing establishments in the towns of St. Louis Park and Hopkins, with 3 deaths in St. Louis Park; at Excelsior, on the south side of Lake Minnetonka, the loss was considerable, and there was a great deal of damage to the very fine properties on the north shore of Lake Minnetonka.

In Washington County, there was loss by the breaking up of large log rafts in St. Croix River, and to the extensive lumbering and other industries in and about Stillwater.

There were many exhibitions of the wonderful force of the wind, and many very strange and curious things were done by it.

Fifteen deaths were reported in Minnesota, 2 in South Dakota, and 1 in Wisconsin.

THE ORIGIN OF THE CUBA CYCLONES OF JUNE 13-14, 1904.

By Maxwell Hall, dated Jamaica, August, 1904.[1]

On June 10 the barometric pressure over Jamaica was a little below the mean; on the 11th there was a further slight fall, so that the barometric pressure was about 0.1 inch below the mean that day. On the 12th and the morning of the 13th the pressure continued to give way, and at the Kempshot Observatory near Montego Bay the lowest was 0.3 inch below the mean at 7 a. m. on the 13th.

Up to the evening of the 12th this fall was due to a stationary cyclone or cyclonic depression, whose center was 20 miles west of the Negril Point Light-house. That evening the center began to move slowly toward the northeast, and then another center appeared early in the morning of the 13th about forty miles to the southwest of the light-house.

The first center we shall call *A*, and the second *B*.

A passed the light-house between 3 and 4 a. m., local time, June 13, and at 5 a. m. the wind veered to the south as *A* proceeded on its course, but, as *B* approached, the wind backed to southeast again; then it veered to south-southeast; the center *B* passed at about 8:30 a. m., and the wind continued to veer to south and southwest.

It may here be noted that the direction and force of the wind at any place under the influence of two centers are the resultants of the direction and force due to each center. Thus at 5 a. m. the wind at the light-house due to *A* would have been southwest; that due to *B*, southeast, with a resulting direction south.

A 6 a. m. the center *A* was near Kempshot, and it moved away in the direction of Santiago de Cuba at the rate of about fourteen miles an hour.

The cyclone *B* took a northerly course as far as Moron in

[1] A preliminary note on this subject appeared in the Monthly Weather Review for June, p. 273, under the heading "Cyclonic Depression and Flood in Jamaica." Later advices, showing that there were two separate depressions, necessitate a modification of the previous statement that the center took a curved path around the west end of the island.—Ed.

Cuba, and then proceeded northeast. Off the Negril Point its rate of motion was about the same as that of A.

The fall of the barometer at the center of A was about 0.8 inch on the 12th and morning of the 13th, but the fall increased, the cyclone developed, and Santiago de Cuba and Guantanamo suffered from a great and destructive hurricane.

The fall of the barometer at the center of B was about 0.6 inch in the morning of the 13th.

The following tables give the reduced observations made at the light-house, at the Kempshot Observatory, and at Kingston.

TABLE 1.—*Observations made at the Negril Point Light-house by Mr. J. S. Brownhill.*

Date.	Time of observation.	Barometric pressure.	Wind. Direction, and velocity in miles per hour.	Wind. Miles in 24 hours.	Notes.
1904.		*Inches.*			
June 8	7:00 a. m.	29.906	ese. 4	365	
8	3:00 p. m.	29.907	ese. 10	....	
9	7:00 a. m.	29.918	ese. 20	460	
9	3:00 p. m.	29.862	se. 30	....	
10	7:00 a. m.	29.849	ese. 30	404	
10	3:00 p. m.	29.836	se. 12	....	
11	7:00 a. m.	29.840	se. 20	580	
11	3:00 p. m.	29.833	se. 30	....	
12	7:00 a. m.	29.795	se. 40	1,005	
12	3:00 p. m.	29.756	se. 40	....	
13	5:45 a. m.	29.710	se. 60	....	10 nimbus southeast.
13	6:15 a. m.	29.712	se. 60	....	Do.
13	6:30 a. m.	29.714	sse. 60	....	Do.
13	7:00 a. m.	29.712	s. 60	690	Do.
13	8:15 a. m.	29.718	ssw. 60	....	Do.
13	8:45 a. m.	29.709	sw. 60	....	10 nimbus south.
13	9:00 a. m.	29.723	sw. 60	....	Do.
13	9:30 a. m.	29.737	sw. 60	....	10 nimbus southwest.
13	10:00 a. m.	29.751	sw. 60	....	Do.
13	11:00 a. m.	29.753	sw. 40	....	Do.
13	11:30 a. m.	29.758	ssw. 40	....	10 cumulo-nimbus southwest.
13	Noon	29.762	ssw. 40	....	Do.
13	12:30 p. m.	29.768	ssw. 40	....	Clear; patches to be seen at intervals.
13	3:00 p. m.	29.754	ssw. 40	....	
14	7:00 a. m.	29.834	s. 30	510	

The barometer is reduced to all the standards and corrected for diurnal variation. The mean barometer was taken to be 29.932. The hour is given in local time. The anemometer is read at 7 a. m. each morning.

The gale was at its height between 3 and 4 a. m. on the 13th, when the puffs of wind must have been from 65 to 75 miles per hour. At 1 a. m. the wind was southeast; at 2, 3, and 4 a. m., south-southeast; and at 5 a. m., south.

TABLE 2.—*Observation made at the Kempshot Observatory by Mr. Maxwell Hall.*

Date.	Time of observation.	Barometric pressure.	Wind. Direction, and velocity in miles per hour.	Wind. Miles in 24 hours.	Rainfall.	Notes.
1904.		*Inches.*			*Inch.*	
June 8	7 a. m.	29.886	e. 5	....	......	As per Negril.
8	3 p. m.	29.891	ne. 3	....	......	
9	7 a. m.	29.940	e. 5	190	1.12	
9	3 p. m.	29.891	se. 7	....	......	Raining all day.
10	7 a. m.	29.857	e. 6	273	0.83	
10	3 p. m.	29.881	se. 4	....	......	Gusts up to 38 miles an hour.
11	7 a. m.	29.829	sse. 7	221	1.22	Cyclonic appearance of weather.
11	3 p. m.	29.831	sse. 6	....	......	
12	7 a. m.	29.791	sse. 15	266	0.00	
12	3 p. m.	29.846	sse. 15	....	......	Gusts up to 39 miles an hour.
12	7 p. m.	29.781	s. 25	....	......	
13	5 a. m.	29.657	s. 50	....	......	Rain during night; heavy squalls, with rain.
13	7 a. m.	29.634	s. 60	478	0.43	Gusts up to 70 miles.
13	9 a. m.	29.709	ssw. 60	....	......	Heavy rain.
13	11 a. m.	29.724	sw. 20	....	......	Heavy rain.
13	1 p. m.	29.757	sw. 20	....	......	Clouds lifting.
13	3 p. m.	29.776	sw. 15	....	......	Squalls at times.
13	5 p. m.	29.768	sw. 15	....	......	Clearing.
13	7 p. m.	29.764	sw. 10	....	......	
14	7 a. m.	29.825	ssw. 5	422	5.20	

The former notes as to time, reduction, etc., are of course applicable to Kingston. On the 12th, Sunday, the observations were made at Vale Royal, near Kingston.

TABLE 3.—*Observations made at Kingston by Mr. J. R. Scotland.*

Date.	Time of observation.	Barometric pressure.	Wind, in miles per hour.	Notes.
1904.		*Inches.*		
June 8....	9 a. m.	29.898	se. 14	5 alto-cumulus southwest. 5 strato-cumulus southeast.
8....	3 p. m.	29.919	se. 18	7 cirro-stratus. 2 strato-cumulus southeast.
9....	9 a. m.	29.911	se. 7	8 alto-stratus west-southwest. 2 strato-cirrus southeast.
9....	3 p. m.	29.877	se. 5	6 alto-cumulus southwest. 3 strato-cumulus southeast.
10....	9 a. m.	29.843	se. 10	1 alto-cumulus southwest. 2 strato-cumulus southeast.
10....	3 p. m.	29.884	se. 5	8 nimbus southeast; heavy rain day and night.
11...	9 a. m.	29.840	0	3 alto-stratus. 7 strato-cumulus southeast.
11....	3 p. m.	29.824	se. 5	8 alto-stratus west-southwest. 2 strato-cumulus southeast.
12....	7 a. m.	29.815	se. 8	8 strato-cumulus southeast.
12....	3 p. m.	29.801	se. 18	7 strato-cumulus southeast.
13....	9 a. m.	29.791	se. 7	8 nimbus southeast; rainy.
13....	11 a. m.	29.774	se. 10	3 alto-cumulus west. 5 strato-cumulus southeast.
13....	1 p. m.	29.800	se. 15	3 alto-cumulus west. 4 strato-cumulus southeast.
13....	3 p. m.	29.799	se. 18	9 nimbus southeast; rainy.
14....	9 a. m.	29.822	se. 8	6 cirro-stratus west. 2 strato-cumulus southeast.
14....	3 p. m.	29.825	se. 14	4 strato-cumulus southeast; clearing.

Fig. 1 shows the position of the centers at 6 a. m. on the 13th. Great accuracy is out of the question, but it will be found that the fall of pressure at Negril is the sum of the falls due to A and B, and that the direction of the wind is the resultant of the winds due to each center, and this is also true for Kempshot.

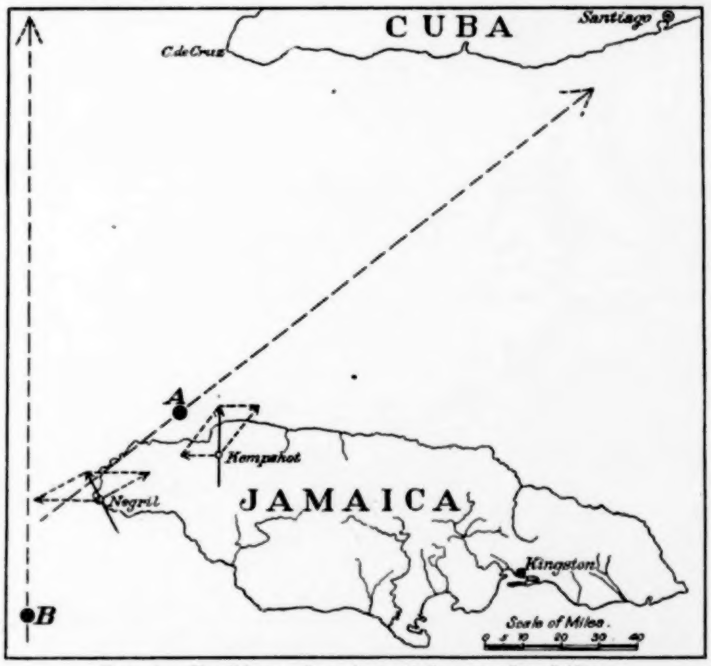

FIG. 1.—Positions of centers at 6 a. m., local time.

Kingston was rather too far from the centers to give us much information, and no reading was taken before 9 a. m. The lowest reading was at 11 a. m., which may show that the velocity of A as given above was somewhat too large, in accordance with the news that the worst of the cyclone at Santiago occurred at night, and not in the early evening.

Returning to Jamaica: a gale from the south swept the west end of the island and did some damage to shipping and to banana trees, but the rest of the island experienced only high winds and heavy rains.

There had been heavy rains on the 10th and 11th over the greater part of the island, so that when 6 or 8 inches fell over the western end of the island in a few hours in the morning of the 13th, low-lying towns were flooded, the rivers came

down in flood and destroyed the banana trees planted along their banks, and carried away several bridges. Among the latter was the Barnet Bridge at Montego Bay; 3 out of the 5 mason-work arches were carried away, and the river, which rose 20 feet above its usual level, took a short cut from the railway bridge through the railway station to the sea.

Cane Valley, near the center of the island, suffered again, but not to the extent it did in June, 1886, when the water rose 60 to 100 feet. The flood rains that year were much heavier than the rains we are now considering, but they were both due to the same cause; namely, a barometric depression.

The barometer falls slightly over a very large area, much rain falls, a definite center is formed, and the whole phenomenon may, or may not, develop into a great cyclone.

The two depressions of June 13, 1904, certainly developed into cyclones, but nothing more was heard of the depression of June 7 and 8, 1886.

RECENT CONTRIBUTIONS TO CLIMATOLOGY.

By C. F. TALMAN, U. S. Weather Bureau.

Observational work in meteorology may be said to correspond to field work in the biological sciences, and has led up to corresponding conditions in recent years. The biologist of to-day finds himself confronted with an enormous mass of taxonomic material, which he has lately set himself seriously to the task of digesting and summarizing, so that it may form the basis of philosophical research. In a like manner the meteorologist has now observed the weather for longer or shorter periods over a great part of the earth's surface, but has only recently devoted much attention to the highly important work of computing means of the various series, in order to establish normal values for the climate of each meteorological station and group of stations.

The delay in reaching this stage in climatological investigation was in a measure justified by the fact that the extra-tropical regions, in which the majority of long weather records exist, are just those in which the weather variability from year to year is greatest, and in which, therefore, very long records are needed before satisfactory normals can be deduced. For example, it is estimated that the normal monthly temperature of Vienna for the winter months will not be known to within 0.1° C. of accuracy until four hundred years of recorded observations shall be available for discussion; while in western Siberia observations for eight hundred years will be needed.[1] When we come to consider the prospect of obtaining accurate decadal, pentadal, or daily normals, the extent of the record required seems to relegate the whole subject to our remote posterity. It should be remembered, however, that practical climatology does not, for all purposes, require minute exactitude in its numerical results; the determination of a monthly normal temperature to within one or two degrees of accuracy is exceedingly serviceable, while even the rough results obtained from two or three years of observations are vastly better than nothing. This fact has found recognition, and climatologists have recently been quite industrious in giving us mean values based on short records.

The immediate occasion of the present paper is the appearance, during the current year, of two very notable contributions to the quantitative climatology of extensive regions of the earth. These are:

Klimatographie von Österreich. I.—Klimatographie von Niederösterreich, von J. Hann. Wien, 1904.

Indian Meteorological Memoirs, Vol. XVII. I.—Normal monthly and annual means of temperatures, wind, humidity, cloud, rainfall, and number of rainy days of stations in India, etc. Calcutta, 1904.

The former of these works, which is published under the direction of the Austrian Zentralanstalt, inaugurates a series of sectional climatographies, sixteen in number, which when complete will cover the whole of Austria. Coming from the pen of the most eminent of living climatologists, this memoir may be considered the embodiment of the best and most modern climatological ideas. In fact, Doctor Pernter, the Director of the Zentralanstalt, in his introduction to the series pays a tribute to his distinguished predecessor and teacher, Doctor Hann, to whom, he says the preparation of the initial monograph was entrusted, in order that the authors of the subsequent parts might have for their guidance a perfect model for form and method.

Given a series of meteorological observations which it is desired to discuss fully in the form of tabulated averages, the number of tables required in order to bring out every feature of the climate deducible from the original figures is very large. This fact is well illustrated by the work now under consideration. Taking the temperature tables alone, we have, for certain stations: Mean variability of the daily mean temperature (for each month and for the year); mean frequency of daily temperature changes of given magnitudes (comparing the mean of each day with the mean of the next); departure from normal mean temperature for the coldest and warmest winters, and for the coldest and warmest summers, during one hundred and twenty-five years; extreme monthly and annual mean temperatures for fifty years; mean monthly, seasonal, and annual temperatures at various altitudes; probability that the yearly minimum will fall below 0°, —5°, —10°, —20°, etc.; average dates on which, in the annual march, the daily temperature rises above and falls below 5°, 10°, and 15°; duration, in days, of a daily temperature of 5°, 10°, and 15°; mean difference between the 2 p. m. and 7 a. m. temperatures for each month and for the year; besides the values regularly found in climatological summaries, such as the monthly and annual means, the means of the monthly and annual extremes, and the absolute extremes.

In the discussion of the other elements, the following are some of the tables introduced: Fluctuation of the yearly totals of rainfall for twenty years (the value for each year expressed as a percentage of the 20-year mean); distribution of the annual rainfall among the months (per cent); mean duration of rainless and rainy periods for each month and for the year; mean number of days on which the wind velocity reaches 6 (decimal scale) for each season and the year; influence of the wind direction upon the several meteorological elements.

It will be seen that a number of climatic features are here brought out which are commonly neglected in climatological discussions; but, far from exhausting the possibilities in this direction, Doctor Hann's memoir only opens up new vistas to the climatologist. It is probable, however, that nearly all aspects of the climate of Lower Austria which are of practical interest and for which materials were available are here presented. There is no discussion of pressure, because, as the author says, "the differences thereof over the relatively small surface of a country like Lower Austria have no climatological importance." Phenological figures also are omitted because of the lack of trustworthy observations.

The arrangement of this work presents some very excellent features. The area under discussion is divided into a few climatic regions, which are discussed separately. The stations in a single region are considered together in connection with each climatic feature; then a compact climatic table is given for each station. Finally, at the end of the volume the more important climatic values are more fully presented in general tables, convenient for reference.

Turning now to the latest of the Indian Meteorological Memoirs, we are confronted with a work of truly imposing proportions, the plan of which presents many contrasts to that of the Austrian memoir we have just been considering. While

[1] Hann: Handbuch der Klimatologie. I Bd. Pp. 11-12.

the region discussed by Doctor Hann was but some seven or eight thousand square miles in extent, the domain of the Indian climatologist amounts to above two million square miles, including, in addition to the Indian Peninsula, stations in Ceylon, Burma, Persia, and Afghanistan, and even stations so remote as Aden, Mauritius, and Zanzibar.

This vast territory is, of course, hardly amenable to the methods of discussion employed by Doctor Hann. The number of stations represented in connection with the various elements other than rainfall ranges from 107 to 171, while the number of rainfall stations included is 2219. Only in the case of the rainfall values is there any attempt at topographic grouping. In the other tables the stations are arranged roughly in a series, beginning in Burma, stretching thence, by way of the Ganges plain and the Himalayas, to the northwest frontier; then, taking a fresh start at Colombo (Ceylon), passing up the Malabar coast, thence across the Deccan and down the Coromandel coast, and winding up at Trincomalee (Ceylon), after which come various islands and other outlying and extra-Indian stations. The climatic regions indicated on the various charts published by the Indian Meteorological Service are not distinguished typographically in these tables, and no regional means are given. This is to be regretted; but perhaps we should consider this memoir as a mere provisional compilation, since the values which it embraces were, as the compiler states, computed in order to furnish the data for a Climatological Atlas of the Indian Empire, the early publication of which has been sanctioned by the government of India. At any rate every meteorologist will welcome the appearance of so vast an array of normal values for this important region, whose climate is so frequently made the basis of investigations of the great problems of the atmosphere, and is so often called upon to furnish the weapons of controversy to the meteorological theorists. While previous publications of the Indian Service have contained normal values, introduced generally in connection with current values for purposes of comparison, these are now for the first time brought together in a compact volume devoted to the presentation of normals exclusively, and constituting a standard reference book upon Indian climate. Among the distinguishing features of this work are the reduction-constants, for various elements, given for each station, whereby true daily means may be obtained from the means of the observed readings. The methods of obtaining these constants have been discussed in previous numbers of the Indian Meteorological Memoirs. These corrections are applied in the tables, and thus we have what purport to be true diurnal means of the several elements. Other noteworthy features are a table of average monthly and annual mean temperatures reduced to sea level, and tables of the average monthly and annual "steadiness of the wind" at observation hours and for the day.

Minor contributions to climatology have of late appeared in such numbers that it is not easy to select those most worthy of mention. The present year has witnessed the beginning of an important series of publications entitled Climatological Observations at Colonial and Foreign Stations, in which the British Meteorological Council will publish summaries of the observations which it receives from the Foreign Office, the Colonial Office, and directly from observers in various British dependencies and in foreign countries. This undertaking recalls the valuable Meteorological Observations at the Foreign Stations of the Royal Engineers and the Army Medical Department, which appeared in a single volume published in 1890. It is a similar work to that undertaken by the Deutsche Seewarte, in its Ueberseeische Beobachtungen, except that the British reports are apparently not to contain daily values. In the first and only number which has come to hand—Tropical Africa, 1900–1901–1902, with Summaries for Previous Years—we have the various yearly summaries for each station in the region indicated brought together, and a few lustral means also appear. It is to be hoped that future publications in this series will give us averages derived from the whole extent of each record; in other words, provisional normals, which the record of each subsequent year will bring nearer to the true normal values for the station.

In the enumeration of recent contributions to climatology might, of course, be included a number of well-known serial publications, appearing at fixed intervals, which regularly include normals brought up to date. These, however, the writer hopes to discuss in a subsequent paper, in connection with certain standard reference books of climatology.

The establishment of normal values, or rather of series-means which are a more or less close approximation to normal values, is now going forward apace, and the climatologist begins to hope that all of the world's vast accumulation of meteorological observations will soon have been made to bear fruit in the shape of summarized climatological data. In this connection reference may be made to the forthcoming Climatology of the United States, now in preparation in the Central Office of the Weather Bureau, which will give in a concise form the normal climatic values for upward of 600 stations in our own country. Professor Henry, who has this work in charge, hopes that it will be ready for distribution by the autumn of 1905.

RECENT PAPERS BEARING ON METEOROLOGY.

Mr. H. H. Kimball, Librarian and Climatologist.

The subjoined titles have been selected from the contents of the periodicals and serials recently received in the Library of the Weather Bureau. The titles selected are of papers or other communications bearing on meteorology or cognate branches of science. This is not a complete index of the meteorological contents of all the journals from which it has been compiled; it shows only the articles that appear to the compiler likely to be of particular interest in connection with the work of the Weather Bureau. Unsigned articles are indicated by a ——.

Science. New York. Vol. 20.
Bishop, S. E. The cold-current system of the Pacific, and source of the Pacific Coast Current. Pp. 338–341.

Smithsonian Miscellaneous Collections. Washington. Vol. 2.
Fowle, F. E., Jr. The absorption of water vapor in the infra-red solar spectrum. Pp. 1–12.

Nature. London. Vol. 70.
—— Marconi weather telegrams. Pp. 396–397.
Eliot, John. The British Association at Cambridge. Section A. Subsection Cosmical Physics. Opening Address. Pp. 397–406.
Cohen, J. B. Sooty rain. P. 424.
Ashworth, J. R. A source of the ionisation of the atmosphere. P. 454.

Proceedings of the Royal Society. London. Vol. 74.
Lockyer, Norman and Lockyer, William, J. S. A probable cause of the yearly variation of magnetic storms and auroræ. Pp. 90–95.

Science Abstracts. London. Vol 7.
B[orns], H. Heat exchange in the soil, the water and the atmosphere. [Abstract of article of J. Schubert.] P. 572.

Scottish Geographical Magazine. Edinburgh. Vol. 20.
—— Meteorological results of the Belgian Antarctic Expedition. [Review of a pamphlet by H. Arctowski.] Pp. 493–494.

Symons's Meteorological Magazine. London. Vol. 39.
Gethin-Jones, J. R. The wettest place in Wales, with some remarks on the rainfall of the year 1903. Pp 121–126.
—— Wireless telegraph and meteorology. Pp. 127–128.

Annuaire de la Société Météorologique de France. Paris. 52me année.
Teisserenc de Bort, L. Observations de la station franco-scandinave de sondages aériens à Hald. Pp. 159–161.
David [P]. Sur la distribution annuelle moyenne et extrême de la pluie dans les Iles Britanniques. [Analysis of a paper by Dr. Mill.] Pp. 161–165.
Angot, Alfred. La pluie à Bouin (Vendée). Pp. 173–177.

Archives des Sciences Physiques et Naturelles. Genève. 4me période. Tome 17.
Forel, F. A. Variation de température avec l'altitude. P. 207.

Ciel et Terre. Bruxelles. 25me année.
—— Le climat du désert de Syrie. Pp. 303–304.

Comptes Rendus de l'Académie des Sciences. Paris. Tome 139.

Chauveau, A. B. Sur la déperdition de l'électricité dans l'air, observée au sommet de la tour Eiffel pendant l'orage du 4 août. Pp. 400-401.

Roche, —. Observations sur la foudre en boule tombée à Autun le 16 juillet [1904]. P. 465.

La Nature. Paris. 32me année.

Jaubert, Joseph. La pluie dans la région parisienne. Pp. 202-203.

Jacquot, L. Le vent et les vagues sur le Lac Léman. P. 206.

D. B. Le service des annonces des crues aux États-Unis. Pp. 207-208.

Touchet, Em. Le halo solaire du 25 juillet, 1904. Pp. 210-211.

Le Temps qu'il Fait Mons. Août, 1904.

Bracke, A. La météorologie en publique. Pp. 171-175.

Memorie della Società degli Spettroscopisti Italiani. Catania. Vol. 33.

Teglio, Emiglio. A proposito di due memorie di Knut Angström sulle caratteristiche spettrali dell' ozono. Pp. 141-147.

Annalen der Hydrographie und Maritimen Meteorologie. Berlin. 32 Jahrgang.

Meinardus, Wilhelm. Ueber Schwankungen der nordatlantischen Zirkulation und ihre Folgen. Pp. 353-362.

Maurer, H. Die tägliche Variation des Erdmagnetismus. [Abstract of work by Askel S. Steen.] Pp. 385-388.

Wegemann, [G.] Erweiterung des barischen Windgesetzes nebst Anwendungen. 1. Beziehung zwischen Windgeschwindigkeit und Isobarenabstand. Pp. 408-415.

Brennecke, W. Einige Ergebnisse der dänischen Expedition nach Ostgrönland 1898-1899. Pp. 415-419.

Gaea. Leipzig. 40 Jahrgang.

—— Die atmosphärische Elektrizität und die Elektronentheorie. Pp. 529-532.

—— Zusammensetzung der atmosphärischen Luft. [Review of work of H. Henriet.] P. 568.

—— Die Stellung der Meteorologie unter den Wissenschaften. Pp. 584-592.

Physikalische Zeitschrift. Leipzig. 5 Jahrgang.

Bumstead, H. A. Atmosphärische Radioaktivität. Pp. 504-509.

Sitzungsberichte der Königlich Preussischen Akademie der Wissenschaften. Berlin. 40 Bd.

Warburg, E. Ueber den spektralanalytischen Nachweis des Argons in der atmosphärischen Luft. Nach Versuchen des Hrn. Lilienfeld. Pp. 1196-1197.

Das Weltall. Berlin. 4 Jahrgang.

—— Ueber internationalen Wolkenmessungen. [Abstract of paper of [R.] Süring.] Pp. 423-424.

Das Wetter. Berlin. 21 Jahrgang.

Köppen, W. Ueber den Zusammenhang zwischen der Stärke der Platzregen und ihrer Dauer. Pp. 169-177.

Meteorologische Zeitschrift. Wien. Band 21.

Ekholm, Nils. Wetterkarten der Luftdruckschwankungen. Pp. 345-357.

Süring, R. Bericht über die Ergebnisse der deutschen Wolkenbeobachtungen im internationalen Wolkenjahre. Pp. 358-371.

Stentzel, Arthur. Ueber die sogenannte "Temperatur des Weltraumes." Pp. 371-375.

—— Atmosphärische Absorption und Emission der äussersten ultravioletten Strahlen. (Uebersetzt aus "Nature," 14 Januar, 1904). Pp. 375-376.

Drapczynski, Viktor. Ueber die Luftströmung in der Umgebung der Barometer-Minima und -Maxima zu Moskau. Pp. 376-377.

—— Krebs, W. über boraartige Fallwinde an Gebirgsseen. Pp. 377-378.

Mache, H. Ueber die Geschwindigkeit und Grösse der Regentropfen. Pp. 378-380.

Friesenhof, Gregor. Einiges über Ozonbeobachtung. Pp. 380-382.

—— Hanamann, J. Niederschlagsbeobachtungen in Lobositz (Böhmen.) P. 382.

Forster, Adolf E. Die klimatischen Verhältnisse von Eger-Franzensbad und Marienbad in Böhmen. Pp. 382-383.

Hann, J[ulius]. Klima von Formosa. (Taiwan). Pp. 383-387.

—— Danckelmann, R. Resultate der Regenmessungen in Debundscha. Pp. 387-388.

Réthly, Anton. Starker Hagelfall zu O-Gyalla. Pp. 388-389.

Götz, P. Merkwürdige Erscheinung am Abendhimmel. Pp. 390-391.

Meinardus, W. Repartition de la pression atmosphérique sur l'Europe, observée de 1881 à 1895, et direction moyenne du vent sur les littoraux. [Review of work of G. Rung.] Pp. 391-392.

EARTHQUAKE OF AUGUST 27, 1904.

By Prof. C. F. Marvin.

An earthquake was recorded by the Omori seismograph at the Weather Bureau on August 27, beginning at $5^h\ 4^m\ 57^s$ p. m., seventy-fifth meridian time.

The disturbance was evidently of great severity, that is to say, the amplitude of motion of the earth particle (5.35 mm.) during the maximum waves was fully seventeen times as great as in the case of any earthquake thus far recorded at the Weather Bureau. So far as known, however, the earthquake was not felt by any individuals in Washington, or at any other point in the United States. The record is exceedingly clear and perfect in all details. A small section of the middle portion of the sheet, showing the maximum waves of the principal portion, is reproduced in fig. 1.

The Monthly Weather Review for June, 1903, at page 271, gives a description of the seismograph.

The following table gives the times of the principal features of the record. The north and south component of horizontal motion only was recorded.

Earthquake of August 27, 1904, seventy-fifth meridian time.

	h.	m.	s.	h.	m.	s.
First preliminary tremors began	5	4	57 p. m.			
Second phase began	5	12	07 p. m.			
Second preliminary tremors began	5	15	59 p. m.			
Principal portion began	5	21	39 p. m.			
Principal portion ended	5	26	42 p. m.			
End of earthquake	6	24	41 p. m.			
Duration of first preliminary tremors				0	11	2
Duration of second preliminary tremors				0	5	40
Duration of principal portion				0	5	3
Total duration of earthquake				1	19	44
Average complete period of 4 large initial waves, principal portion						24.1
Average complete period for 4½ large waves at end of principal portion						14.9
Period of pendulum						26.0
Maximum double amplitude of actual displacement of earth at seismograph						5.35 mm.
Magnification of record						10 times.

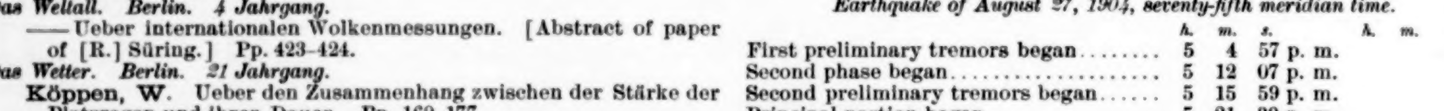

Fig. 1.—Principal of portion of record of the earthquake of August 27, 1904.

The Superintendent of the United States Coast and Geodetic Survey furnishes the following information in regard to this earthquake:

A letter from Mr. P. H. Dike, the Magnetic Observer at Vieques, Porto Rico, contains the following data regarding the earthquake of August 27, 1904, as recorded on the Bosch Omori seismograph at that place. The seismograph records both the north-south and east-west components of horizontal motion.

The time is reduced to seventy-fifth meridian time.

	N.S.	E.W.
	h. m. s.	*h. m. s.*
Time of beginning	5 08 40	5 08 48
Time of maximum	5 40 06	5 36 06
Time of ending	6 58 31	6 49 19
Maximum double amplitude of actual displacement of earth at seismograph	4.2 mm.	3.3 mm.
Period of pendulum (kept constant)	26.3 sec.	24.7 sec.
Ratio of magnification	10	10

A letter from Mr. W. F. Wallis, Magnetic Observer at Cheltenham, Md., states that the magnetograph records show the disturbance very plainly, it being especially well marked in the horizontal and vertical intensity traces, both on Eschenhagen and Adie instruments.

Five distinct shocks can be recognized, the approximate times of which are: $5^h\ 06^m$; $5^h\ 23^m$; $5^h\ 26^m$; $5^h\ 31^m$, and $6^h\ 21^m$, seventy-fifth meridian time, counting from 0^h at midnight to 24 hours.

A newspaper report at the time states that a violent earthquake was felt at San Martin in the State of Oaxaca, Mexico, accompanied by "deafening subterranean rumblings."

DR. GEORGE W. HAY.

Dr. George W. Hay, observer and translator in the Weather Bureau, died at Washington, D. C., August 11, 1904. Doctor Hay was born at Conesville, N. Y., August 10, 1847. In December, 1874, he enlisted in the Signal Corps of the Army, in which service he remained until the organization of the Weather Bureau, when he was transferred to the civil establishment, in which he continued until his death, the two periods extending almost thirty years. Doctor Hay was a man of high personal integrity, thoroughly conscientious in the discharge of his duties, unobtrusive in manner, kindly and affable in disposition.

CORRIGENDA.

MONTHLY WEATHER REVIEW for July, 1904, p. 329, under "Weather of the Month" for "in charge of Division of Meteorological Records" read "Chief of Division of Meteorological Records."

MONTHLY WEATHER REVIEW for July, p. 316, column 1, 17th line, under fig. 2, for $\frac{b+J'}{L}$ read $\frac{b+J}{L}$.

MONTHLY WEATHER REVIEW for April, p. 173, column 2, paragraph 2, line 6, for "$38\frac{1}{2}$" read "$58\frac{1}{2}$."

NOTES AND EXTRACTS.

THE PRIMARY AND SECONDARY RAINBOWS.

When the sunlight falls upon a drop of rain, even though the raindrop be rapidly falling, yet so quick is the action of light that it goes through the drop and passing on enters the eye of the observer, as though the drop were stationary. Now a drop of water can reflect sunlight as nicely as does a mirror. It can also refract or bend the rays of light as does a glass prism. If a prism or a piece of broken glass be properly held in the sunshine, the many different colors that are produced may be perceived. There is the whole range through red, green, yellow, and blue up to the indigo and violet, that constitutes a spectrum. When a ray of light passes through a drop of water it produces a spectrum somewhere so that one will see it and enjoy the beautiful colors if his eye is in the right position. Now, when the sun's rays, *SS*, fall upon a drop at A_1, some of them enter the drop at *a*, are reflected at *b* back to the point *c*, where they come out and form the spectrum, *vr*. If the observer is at *O* he may see the violet part of the spectrum. There is another drop, A_2, a little way above A_1, which produces a similar spectrum, but the red ray is the one that comes down toward the observer at *O* so that he sees the violet ray below and the red ray above with a beautiful spectrum between them. Now, somewhere above these drops there may be another one, A_3, so located that a ray from the sun may enter this drop at the point *m*, be reflected twice within the drop at *o*, *p*, and issue from it at *q* in such a direction that red rays may enter the observer's eye at *O*. A little above A_3 may be another drop, A_4, into which a similar ray of sunlight enters and after two internal reflections sends its violet ray to the observer's eye at *O*.

Thus it will happen that the drops between A_1 and A_2, although themselves invisible, send to the observer at *O* the bright beams of light that make up a bright spectrum or band of colors having the violet below and the red above. This is called the primary rainbow, because it is the brightest and the one most frequently seen. The drops between A_3 and A_4 send to the observer at *O* the other set of colors forming the secondary rainbow, having the red below and the violet above. These latter colors are not quite so brilliant as those of the primary, principally because the light was reflected twice within the drops and much of its color thereby lost. The secondary rainbow is not seen so often as the primary, because the sun has to be lower down near the horizon in order to bring it out perfectly.

The reason why these two rainbows have their colors arranged in opposite directions is not because the secondary is a reflection of the primary bow, as is often said. There is nothing in the sky like a mirror from which the primary bow could be reflected. If we look into a basin or pond of water we may, indeed, see the primary bow reflected, but in this case not only are the colors turned upside down, but the whole arch of the bow is inverted. Now, the arch of the secondary rainbow is not inverted, but is parallel to that of the primary; it is only the order of the colors that is inverted, and this inversion is the result of the two reflections within the drops A_3 and A_4 by which the path of the ray crosses on itself. The one reflection inside of drops A_1 and A_2 gives a direct path in which the lines do not cross each other. It is the crossing of the lines *Sm* and *qr*, and not the reflection of the arch as a whole, that inverts the order of every individual color spectrum.

In addition to the color of the brilliant primary rainbow, there are sometimes beautiful fringes of color close along the edges of the primary, and these are called supernumerary bows.

The primary rainbow is formed of arcs of circles whose radii vary from 39.6° for the violet to 42.1° for the red. Its center is at a point directly opposite the sun as seen by the observer. If the sun is in the horizon the bow will be a complete semicircle, having its center in the opposite horizon. The higher the sun is above the horizon, so much the lower must the center be below the horizon. If the sun should be 40° above the horizon, then the rainbow would be almost wholly below and we could only see a small bit of color just above the horizon. Therefore, the only time when we can see the rainbow is when the sun is not too high. Consequently, we rarely see them in the middle of the day. Rainbows can be formed only when the sun shines upon rather large drops of water. Very small

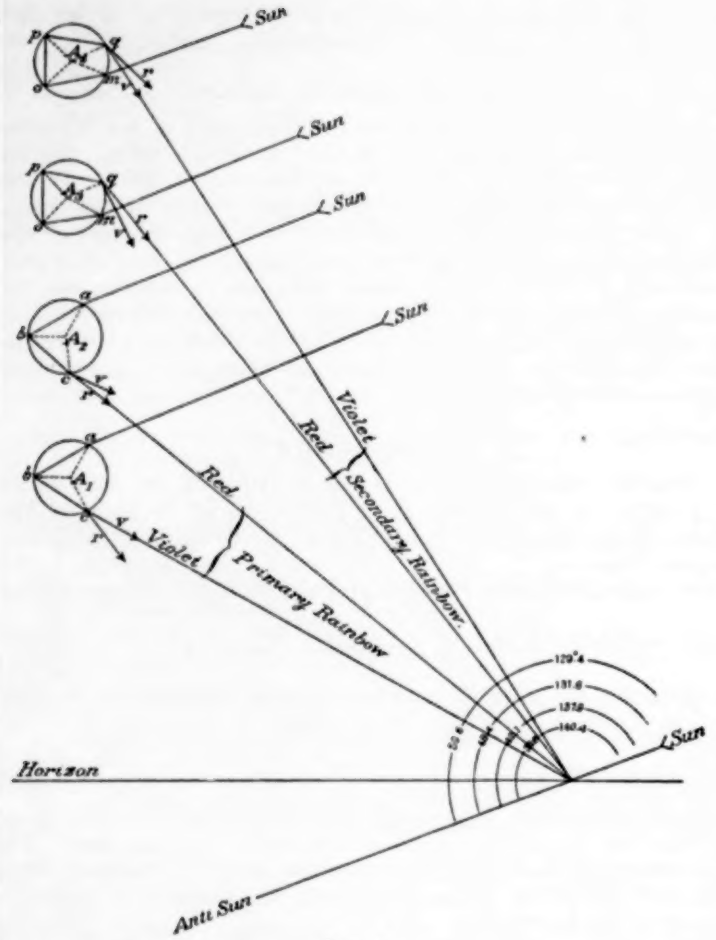

Fig. 1.

drops, like those of a fog or cloud, produce other phenomena called glories and halos. It is the large raindrops that make the finest rainbows, but these large raindrops occur principally in the warmer half of the year and especially in the afternoon thunderstorms. Therefore it is that we see more rainbows during summer afternoons when the sun is nearing the horizon then at any other time. It is not impossible for them to occur at other times, and they can always be seen in the early morning or late afternoon in the falling drops of a fountain or waterfall; sometimes also in the dew-drops on a lawn. Attempts have been made to photograph the rainbow and to a certain extent have been successful, but the colored lights are much fainter than the white light above and below it; one needs a dark background to bring out the rainbow effectively. Moreover, one can not photograph all colors of the spectrum on any one sensitive plate. The plate that will photograph the blue end will not show much of the red, and visa versa, and of course the ordinary photographs do not show the colors, but only black and white. It will merely show a bright arc corresponding to that color band in the rainbow to which the plate is specially sensitive, if indeed the diffuse light from the clouds does not entirely obliterate the photographed image of the colored bows because the latter are not very rich in actinic rays.—*C. A.*

FORMATION AND MOVEMENT OF HURRICANES.

A correspondent writes:

If I take a flask of saturated air at atmospheric pressure and absorb all the moisture in it by chemical combinations or by condensation, a partial vacuum is produced, and if I then remove the stopper there is an inrushing of air to complete the equilibrium.

On this fact as a basis he builds up the theory that the condensation of moisture in the free air and its deposition as rain relieve the atmosphere of a certain weight and volume, thereby producing an inflow of air from all sides and the resultant phenomena of a whirlwird or hurricane. This is essentially the theory elaborated by H. W. Brandes and summarized in his Beiträge zur Witterungskunde in 1820. Simultaneously with Brandes in Germany, Espy was carrying on his studies in the United States, and in 1826, or soon after, he came upon the idea that the condensation of atmospheric moisture into cloud and rain, while it might relieve the atmosphere of a small percentage of its weight, must on the other hand involve a great quantity of latent heat, thereby expanding the neighboring air, so that we can not properly speak of the formation of a partial vacuum. The air accompanying the condensed moisture expands, has a smaller specific gravity, and will therefore be pushed upward by buoyancy. Its expansion counteracts all tendency to low pressure.

An excellent exposition of this phase of the problem is given by Professor Hann in the Meteorologische Zeitschrift for 1874, a translation of which will be found on pages 393–396 of the Annual Report of the Smithsonian Institution for 1877.

It therefore becomes at once evident that the low pressure at a storm center does not represent the mere loss of the weight of the falling rain, but that the evolution of latent heat produces a buoyancy that itself produces an upward current, whence follows an inflow to supply the place of the ascending air. This inflow may in the rarest of cases be directed exactly toward the center, and Espy maintained that in all cases of small storms on land the observations showed such a direct radial motion inward. On the other hand, Redfield showed that in large storms on the ocean the rotary or circular motion was much more prominent. Both these and numerous European students described the low pressure within the storm area as due to the centrifugal force developed by the rotation around the storm center. Ferrel showed that this was not sufficent, except possibly in the tornadoes and dust whirls, but that in all large storms on land and ocean an additional centrifugal force, which he calls a deflecting force, due to the rotation of the wind with the earth around the earth's axis must also be considered. These combined centrifugal forces increase with the velocity of the wind relative to the earth's surface, and the velocity of the earth's surface about its axis, which latter depends upon the latitude. An excellent exposition of the whole subject was given by Dr. Julius Hann in the Meteorologische Zeitschrift for 1875, a translation of which is published on pages 426–444 of the Annual Report of the Smithsonian Institution for 1877. We quote the following paragraphs from the concluding pages of this report:

Excess of heat or increased amount of aqueous vapor is the first cause of the ascent of air and its influx from all sides. The inflowing air ascends, condenses its aqueous vapor, whereby its ascensional power is further increased, and from this cause the disturbance can continue for some time. For reasons previously given, this process can, in the equatorial regions, give rise at most to tornadoes only, and in fact Reid's chart shows no cyclone traced back to 10° latitude, no typhoon traced beyond 9°. The greater expansion of the air in consequence of higher temperature and greater quantity of vapor must without doubt exert an influence upon the barometric pressure. Notwithstanding this, that theory is untenable which ascribes all barometric variations to the condensation of cyclonic vapor, for according to it the variations of atmospheric pressure would be greatest at the equator. The atmosphere is exceedingly mobile. Every disturbance of equilibrium will be quickly restored by an inflow of air, provided no whirl arises. If, therefore, the earth had no rotation about an axis, there would the nonperiodical barometric variations nowhere be greater than they are at present at the equator. * * *

The progressive motion of cyclones can be explained by the inequality of the centrifugal forces on the polar and equatorial sides of a cyclone. The term of the gradient depending on $2\,n \sin \phi$ is greater on the polar than on the equatorial side, while the other moments remain the same. The cyclone therefore moves toward the direction of the greater diminution of pressure, or toward higher latitudes. It is therefore not necessary to assume that a real transfer takes place from the equator to the pole of the mass of air that forms the cyclone. The deviating force

and the motions are greater on the polar side of the cyclone, and on this side new portions of the atmosphere are continually drawn into the movement, since on this side $n \sin \phi$ is increasing steadily, while on the equatorial side the motion ceases by reason of the frictional resistance and inertia of the air. Thus the center of the cyclone is continually being formed anew during the progress toward higher latitudes. At the same time the cyclones in the region of the trade winds follow the general movement of the atmosphere, in these latitudes from east to west. From the resultants of the two constant forces, the polar tendency of the cyclones and the influence of the prevailing movement of the atmosphere, there result the parabolic paths of the cyclones, or their recurving when they pass from the trade winds into the region of the west winds.

The influence that a prevailing general current of air exerts upon the progress of a whirlwind that has entered into it evidently consists in this, that the masses of air drawn into the whirlwind have to follow two impulses: one, that which is due to the whirl, and the other, that which is due to their original movements. Therefore, in the region of trade winds and on the northwest side of a whirl, the motions are most accelerated, but on the opposite side are most retarded, and thereby the whirl must receive a tendency to progress toward the northwest. I believe that in its principal feature this agrees also with Lommel's theory of the recurving of the paths of cyclones on their leaving the trade wind region.

* * * * * * *

It would certainly be of the highest interest to know the distribution of temperature in the trade-wind region during a cyclone, for this would afford an important test of our storm theories. I believe, however, that students will find fewer difficulties in my presentation of the influence of a general atmospheric current upon a cyclone entering therein than in Lommel's. I do not think that everything is explained by this and by Ferrel's "polar tendency," but certainly both views should be taken into consideration.

But the buoyancy due to evolution of latent heat is only a part of the force at work. The moment a haze or cloud is formed in the presence of sunshine, the radiant solar heat is absorbed by it. All the heat that should strike the ground does its work at the upper surface of the cloud. The cloudy particles are evaporated, the outer layer of the cloud is warmed, and the cloud as a whole receives a great addition to its buoyancy. One may easily observe the illuminated side of a cloud rising while the shaded side is often falling. The indraft toward a storm region is thus greatly stimulated, and the storm increases in intensity. The barometer does not fall by virtue of solar heat, but by virtue of the increase in the movements of the air. The heat which first warms the cloud, just as it would otherwise warm the air at the ground, does not generally long remain manifest as heat to the thermometer; it becomes latent and maintains in the air a larger amount of moisture than would otherwise be present. This moist air is less dense than dry air and, therefore, more buoyant. Consequently, the ascending masses of air in the atmosphere may have the same temperature as, or be even colder than, adjacent descending masses of comparatively drier air. Either heat or moisture may suffice to make the air buoyant.

In ancient times, Dove spoke of the storms of the North Temperate Zone as occurring between two great currents of air, the northerly, or polar, and the southerly, or equatorial current, and many writers, rather prematurely, taught that great storms were generated in the region between these currents. To this idea two objections were made, namely, that on the one hand the polar and equatorial currents were too far apart and too feeble to have any such interaction on each other, and generate such violent whirls. On the other hand, if this were the sole cause of the hurricane, the latter would soon die away by reason of the resistances to the motion of the wind, and some regenerating process must be discovered in order to explain the generally steady increase in the intensity of such hurricanes up to the maximum before they begin to die away. After many years of discussion on these points it seems now to be generally admitted that a hurricane may begin in the space between opposing currents from the north and south quite as easily as in a region where buoyant air is rising and cloud and rain being formed, because there is a slight diminution of pressure in the space between such opposing currents sliding past each other, a diminution sufficient to induce a slight indraft and the formation of a gentle whirl. As to the maintaining power, however, it still appears likely that the principal source for this must be found in the condensation of moisture, the evolution of latent heat, and the interception of sunshine by the cloud. But we must add to these the further consideration that if the air to the northward is abnormally cold or dry, or that to the southward abnormally warm and moist, then the centrifugal force of the earth's rotation will drive the northerly air toward the equator, while the lighter air, by its buoyancy, is driven northward. Just as centrifugal force acts in separating cream from milk in the separator used in the dairy, while gravity separates the cream from the milk by a slower process in the old-fashioned dairies, so in the earth's atmosphere the heavy air is drawn to the ground by gravity or driven to the equator by centrifugal force, while the lighter air is pushed upward, or pushed northward, respectively. The general interchange of air between the polar and equatorial regions is due to differences of temperature, moisture, centrifugal force, and gravity, and is known as the general circulation of the atmosphere. We may therefore say that a whirl, when once started, developes into a hurricane under the combined favorable action of three forces; namely, the general circulation of the atmosphere, the absorption of solar heat by its own clouds, and the formation of cloud and rain with evolution of latent heat by its own internal currents and by the moisture of the air drawn into it from without. The relative importance of these three depends upon latitude, and must vary from storm to storm, and from day to day.—*C. A.*

A LEGAL DECISION AS TO DAMAGE BY LIGHTNING AND WIND.

In a periodical published by the University of Dijon we find an interesting decision by the civil tribunal of that city, relative to responsibility for damage done by lightning and wind. A few years ago we published a decision of the United States Circuit Court of Appeals (Monthly Weather Review for December, 1900, p. 550) to the effect that forecasts of local rain have not yet attained such commanding respect by reason of their accuracy as to justify us in holding shippers guilty of culpable negligence if they do not provide against damage against heavy rains when light local showers are predicted. "The case of local rains is different from that of storms of great violence, whose existence, course, and time of arrival are publicly announced by signals which the master of a vessel is bound to observe."

With regard to the case on trial before the court at Dijon, the record shows that on June 30, 1901, at about 6 p. m., after a day of exceptional thunderstorms, an extremely violent wind occurred, producing great destruction. Besides the destruction due to the wind, many cases were found in which the damage was undoubtedly due to lightning. Public opinion and the local press attributed everything to the passage of a tornado. The work of destruction was accomplished in a few moments, and was followed by a heavy fall of hail over a large area, after which occurred an exceptionally heavy rain. The administration of the docks of Burgogne attributed a certain damage to lightning, and demanded that the repairs should be made by the nine companies in which they were insured; but, on the contrary, the insurance companies maintained that the disaster was equally attributable to the wind, and that, according to their policies, they did not insure in any manner against damage done by "hurricanes or cyclones, tornadoes, or any other meteorological or electrical phenomenon, except thunder and lightning."

In the trial before the judges, the facts of the disaster, the wind, and the lightning, were abundantly established. Then came a large mass of testimony relative to phenomena observed in Europe and America in connection with thunderstorms and tornadoes. Written or printed documents were

presented from about twenty meteorologists, including Profs. Alexander G. McAdie and Alfred J. Henry, of the Weather Bureau. Considerable time was given to the study of analogous cases of destruction by other tornadoes, such as that of Monville, August 19, 1845; St. Claude, August 19, 1890, and an elaborate study was made of the destruction in the present case, Dijon, June 30, 1901, most of which was evidently due to wind. After three days of pleading, the civil tribunal of Dijon finally rendered the following judgment on the 1st of July, substantially in accord with the opinion of two of the three experts: namely, Galliot, engineer-in-chief of bridges and roads; Pigeon, professor in the faculty of sciences at the University of Dijon; and Julien, civil engineer in Paris.

Notwithstanding the uncertainty of the experts, who have been unable to determine with exactness the amount of destruction due to lightning, on the one hand, and that due solely to the violence of the wind, on the other hand, it is, nevertheless, possible for the Court to pronounce the opinion that it is certain, according to the testimony of the experts, that the lightning and the wind acted almost simultaneously; that it is also certain that if the lightning, striking the building, M, and the shed, N, had not produced in these two structures a weak point, as is shown by the partial destruction of the boards and framework, that the wind would not have had force enough to demolish these two buildings, as was done; that the proof of this fact is also shown by that other testimony that the building, M, and the shed, N, are the only ones injured in the neighborhood of the docks. Other buildings, more or less important and of construction more or less unsubstantial, have suffered no damage, except, perhaps, some tiling displaced, such as the shed at the right of the principal entrance, on the boulevarde Voltaire, and the small administration building just opposite the entrance gate, which were not touched. It must, therefore, be concluded that the lightning stroke and the violence of the wind, by their combined action, had an equal part in the disaster, from which it follows that the responsibility for the disaster should be attributed one-half to the lightning stroke and one-half to the violence of the hurricane.

* * * Considering that the insurance companies have stipulated, in the general conditions printed in their policies, that the insurance covers only damage by fire resulting from lightning, but that, in consideration of a special premium, they are accountable for damages other than those by fire resulting from the stroke or explosion of lightning (the insurance against lightning not including in any case the damage caused by hurricanes, cyclones, tornadoes, or any other meteorological or electrical phenomenon other than thunder or lightning):

Considering, nevertheless, that, by a manuscript clause which is found in all the policies, the company gratuitously makes payment for damage that the stroke or explosion of the lightning, when duly attested, did or could have done to objects insured by the present policy, even when fire does not result:

Considering that it results with certainty from the stipulations above that the companies are responsible for damage other than fire directly due to lightning stroke:

Considering that it has been shown that the cause of the damage occasioned to the buildings and merchandise of the docks was due by one-half to the lightning stroke; that it is, therefore, this part which should be borne by the insurance companies and divided among them according to the proportions stated in their contracts.

* * * For these reasons,

The Court, after deliberating in accordance with the law,

Declares that the damages caused June 30, 1901, both to the buildings M and N of the Society of Docks and to the merchandise and contents, are due one-half to the lightning stroke and the other half to the violence of the wind;

Declares that one-half of the damage thus caused should be borne by the insurance companies, according to the proportions stated in their insurance policies, and with interest from the day of demand.

At the conclusion of this judgment, the two parties came together and adjusted this matter.—*C. A.*

WEATHER BUREAU MEN AS INSTRUCTORS.

Mr. H. W. Grasse, Assistant Observer, Moorhead, Minn., on July 19, addressed a class from the summer school, explaining the instruments and methods of the Weather Bureau. The summer school is composed chiefly of teachers from the surrounding country.

Mr. H. W. Richardson, Local Forecaster, Duluth, Minn., lectured at that place on July 27, before the teachers attending the summer school, taking as his subject, The Weather Bureau.

Mr. C. W. Strong, Section Director, Oklahoma, Okla., has been appointed on the faculty of Epworth University as instructor in meteorology, Mr. Strong says: "The courses connected with the University are elective, and can be taken up by the students at any time, and in any year's work. The student can take up our particular work and carry it to completion at any time during the four years' period of instruction."

The State College of Kentucky has decided to establish a course of instruction in meteorology, which will be given for the first time during the coming school year. Mr. R. H. Dean, Observer at Lexington, Ky., has been appointed instructor in meteorology, and has been requested to formulate an outline for the course of study. It is probable that the course will be given in connection with the course in agriculture.

Mr. J. W. Bauer, Section Director, Columbia, S. C., on August 9, addressed an audience of about two hundred planters at the annual meeting of the Darlington Agricultural Society. The address was devoted principally to the work of the Weather Bureau as related to agriculture, including the forecast and warning services, and the Climate and Crop Service.

Mr. Merton L. Fuller, Assistant Observer, Springfield, Ill., delivered, during July and August, eight addresses before three of the teachers' institutes of Iowa, having a total attendance of over five hundred teachers, and comprising nearly the entire teaching force of Buena Vista, Calhoun, and Wright counties. The addresses were illustrated by blackboard work, and by twenty specially prepared charts and diagrams. The general circulation of the atmosphere was briefly reviewed; the storms of both tropical and temperate latitudes were described; and the weather of Iowa, as affected by general atmospheric conditions, was discussed in some detail. Thunderstorms and tornadoes formed the subject of one of the lectures and another was devoted to weather forecasting, with a description of the work of the Bureau, and some consideration of common "weather signs" and "long-range" forecasts.

Mr. Richard H. Sullivan, Observer, Grand Junction, Colo., lectured on August 4, under the auspices of the Western Colorado Academy of Sciences, on "Practical Meteorology." The lecture was illustrated by thirty slides, many of which were prepared by the lecturer from text books and the office climatic charts.

THE HELWAN AND ABBASSIA OBSERVATORIES.

The Survey Department of the Public Works Ministry of Egypt has issued the following notice:

On January 1, 1904, the Observatory, which has hitherto been situated at Abbassia, on the north side of Cairo, was transferred to its new site at Helwan, about 22 kilometers south of Cairo. The buildings are on the limestone rock, which here forms the surface of the desert, and have an open view over the desert to the northeast and south, while on the west is the Nile Valley, the nearest cultivation being 3 kilometers distant.

At present the main building is occupied, and the meteorological equipment, with complete self-registering apparatus, is installed there; also the arrangement for furnishing the noon time-signal, which drops the time balls at Port Said and Alexandria. There is, besides, a new transit house and an equatorial house. The house for magnetic self-registering instruments is not yet completed.

The position of the transit pillar is: Latitude 29° 51′ 33.5″ north, longitude 31° 20′ 30.2″ east of Greenwich. This latter value depends upon the "Venus station," on the Mokattam Hills at Cairo, being longitude 31° 16′ 33.6″ east of Greenwich.

The altitude of the cistern of the barometer above mean sea level at Alexandria is 115.6 meters.

The Abbassia Observatory was established in 1868. It was reorganized in 1900 and equipped with automatic apparatus whose records replaced, to a large extent, the previous tri-

hourly eye readings. The report for 1901, which is the last to be received, gives the data in full, including records of evaporation, earth temperatures up to a depth of 1.15 meters, earthquakes as registered by the Milne seismograph, and solar radiation. This last element, whose determination is facilitated by the comparatively cloudless skies of Egypt, is measured by a Callendar sunshine receiver, which in November, 1901, replaced the ordinary bright and black bulb thermometers in use up to that time.

Observations at the Abbassia Observatory, 1901.

Months.	Temperature, in degrees C.					Relative humidity.			Mean cloudiness, tenths.	Wind.		
										Velocity in miles per hour.		Prevailing direction.
	Mean.	Max.	Min.	Mean max.	Mean min.	8 a. m.	8 p. m.	Min.		Mean.	Max.	
January	12.1	20.5	0.4	17.1	5.8	75	60	25	3.8	4.6	34	sw.
February	15.5	30.2	3.2	22.8	7.8	82	65	10	3.6	2.9	21	nne.
March	19.0	40.4	6.0	27.0	10.5	70	51	4	2.1	4.7	23	nw.
April	21.1	39.4	8.4	28.7	13.0	69	50	6	3.0	4.4	20	n.
May	24.1	43.0	11.2	31.7	15.5	54	39	7	3.1	5.4	21	ne.
June	27.9	42.2	15.4	35.9	19.4	58	43	3	1.8	4.2	18	n.
July	28.7	41.0	19.0	36.5	20.2	70	42	13	1.5	2.9	15	nw.
August	27.8	40.0	17.4	34.3	20.0	74	52	21	1.6	2.7	16	nw.
September	25.5	38.0	16.2	32.5	18.7	75	61	19	1.2	2.6	14	nw.
October	23.2	33.0	13.5	29.4	17.0	80	65	23	2.3	4.3	22	n.
November	18.9	33.6	8.7	24.5	12.5	74	62	15	3.2	2.6	19	s.
December	14.8	27.6	5.2	21.1	8.8	81	68	20	3.8	2.9	24	s.
Year	21.6	43.0	10.4	......	......	72	55	3	......	3.7	......	n.

The precipitation for the year amounted to 35.90 millimeters (1.41 inches) and fell on ten different days. There were six months in which no rain fell. During the 15-year period, 1884–1898, the highest temperature was 45.2° C. (113.4° F.), and the lowest —0.7° C. (30.7° F.). The report also contains observations from 12 second order stations, mean values at Wadi Halfa for the decennium ending in 1900, and gage readings from several stations on the Nile.

The Abbassia Observatory was about three miles from Cairo, with the open desert on one side and the highly cultivated Delta of the Nile on the other. The removal to Helwan was made partly for the sake of obtaining a purely desert exposure and partly to establish a magnetic observatory free from the influence of trolley lines and railroads.—*F. O. S.*

THE HEURISTIC METHOD.

In the article by Prof. J. M. Pernter, a translation of which is published in the MONTHLY WEATHER REVIEW for December, 1903, the author speaks of the heuristic method of discovering a correct method of forecasting. Wherever this word occurred we have translated it variously; namely, as the "discovery method," and again as the "inventive method." From the context, one may easily perceive that "heuristische" refers to that method in accordance with which one invents or devises a method or basis of forecasting, and then endeavors to find agreements between the predictions and the weather that will confirm the forecasts and thus establish the correctness of the principles on which these are based. The word heuristic has generally been used in English to indicate any method by which one discovers unknown laws, but in lieu of any better special word Pernter has adopted this particular application to a method that must be distinguished from the inductive or the deductive.

In the strict, logical, inductive method we first observe many phenomena, such as daily temperatures, pressures, and winds, and from these facts, by various processes of study, we are led to generalizations and hitherto unknown laws, such as the geographic distribution of the diurnal amplitude, the moment of maximum, etc.

In the strictly deductive method, we begin by accepting certain principles or laws, such as the law of inertia or the law of gravitation, or the laws of the conduction of heat; by reasoning upon these by strictly logical or mathematical methods we arrive at their necessary consequences, and thus learn to recognize and accept new laws or hitherto unknown phenomena.

All our progress in science must depend upon the proper application of these three methods of reasoning. Observation and experiment, maps and tables of figures are not the laws of nature, but result from those laws, and we can not pass from this crude data back to the general laws except by adhering to the most rigid logic. Mathematics and even the doctrine of chance are but forms of logic. We are all familiar with the legitimate syllogism, "All B is A; C is B: therefore, C is A." But how many are apt to be misled by the following syllogism: All B is A; C is A: therefore, C is B.—*C. A.*

THE GALVESTON HURRICANE AND OCEAN WAVE.

Mr. Adolphus Carper, Galveston, Tex., writes to the Chief of the Bureau that he is confirmed in his previous statement that the destructive high water at Galveston on September 8, 1902, must have been due to a combination of wind or hurricane wave, and tidal or oceanic wave. He says this view is not generally accepted in Galveston, but is confirmed by the fact that—

the hurricane came upon the city from the north, having traversed Texas, the ravages of which commenced in Bell County, 218 miles north of Galveston. The tidal wave came from the southwest, from the Gulf, sweeping over Galveston in the face of a hurricane calculated to have had a velocity of 120 miles per hour. It, the tidal wave, vanished as quickly as it came; the gale, still blowing, leaving behind a black ooze of a sickening, disgusting odor. About the end of September a sailing craft arrived in New York Harbor whose captain, in his sworn protest at the custom-house, reported having passed a locality in the Bay of Campeachy about the date of the Galveston disaster showing by its vast disturbed area that a submarine volcanic eruption must have taken place in that spot.

ARE THE MOVEMENTS OF THUNDERSTORMS DEFLECTED BY THE TIDE?

A letter from Dr. J. Russell Smith, of the University of Pennsylvania, states that unscientific observers believe that the thunderstorms passing near Cape May are deflected up or down the Delaware Bay by the tides, and asks if this is correct, and what is the explanation?

As this was a new idea in meteorology, a letter of inquiry was sent to our station agent at Cape May, Mr. George L. Lovett, who replied, inclosing a diagram showing the paths of storm movements across Delaware Bay, and stating that they are deflected by the tides and not by the winds. According to his diagram, an incoming flood tide generally enters the bay from the southeast and carries thunderstorms northward; an outflowing ebb tide, moving southward, carries thunderstorms southward; during slack water, storms move eastward straight across, irrespective of wind direction and velocity.

The Editor judges that possibly Mr. Lovett's letter expresses a general belief on the part of the inhabitants of Cape May and the adjoining country, but as there is no a priori reason to believe that tides can have any such influence, it seems important that the dates and observations should be put on record. In order to establish such a novel rule, it will not do to pick out a few favorable coincidences, but it is necessary to carefully plot the path of every thunderstorm for a year or more, and then correlate these paths with the tides and winds. Moreover, the temperature of the surface water must be observed, since it is quite plausible that, with an incoming tide and a southerly wind, the surface water on the east side of the bay would have a different temperature from that on the west side, so that the relative evaporation and moisture of the air may influence the development and path of a thunderstorm. The principal difficulty is the correct plotting of the paths of the storms. This can only be done by the cooperation of many

observers. In fact, one ought to organize a special thunderstorm service for Delaware Bay and southern New Jersey. It is quite impossible for one person, by observations at one station, to determine anything more than the apparent limit of that edge of the storm that is visible to him. The other edge and the center of the storm are usually hidden.

As it is impossible to establish thunderstorm stations on Delaware Bay itself, it may be that it will always be impossible to determine the path of the storm over the bay with sufficient accuracy to establish the truth of Mr. Lovett's theory as to the action of the tides. We hope that he will not fail to secure the cooperation of voluntary thunderstorm observers, and report to the readers of the MONTHLY WEATHER REVIEW the actual paths of the centers of thunderstorms, as well as the advancing fronts of the storms.—*C. A.*

THE DIURNAL VARIATION OF THE BAROMETER AT MILWAUKEE.

In 1868 Maj. R. S. Williamson published his memoir on the use of the barometer in surveys, as Professional Paper No. 15, of the Corps of Engineers, U. S. Army. Among other things he attemped to derive true mean daily pressures by eliminating the diurnal periodicity, and maintained that a close approximation to the diurnal variations could be obtained from a few days' work by a special process of eliminating the slower variations by virtue of which the pressure rises and falls rather regularly for several days at a time, owing to the passage over the country of the so-called areas of high pressure and low pressure. In Williamson's method a straight line is drawn connecting two points on the barometric curve that are twenty-four hours apart, as, for instance, 7 a. m. and 7 a. m. This line, therefore, represents the slower variation; the departures of the curve from this straight line represent approximately the effect of the semidiurnal periodicity.

We have lately received from Miss Mary Lapham, of Oconomowoc, Wis., a manuscript left by her father, the late Prof. I. A. Lapham (apparently written in 1870), in which he gives his hourly barometric readings for one day in each month and the result of treating them by Williamson's method. The manuscript is not entirely in shape for publication, but the following extracts will serve to present the more important features and show the author's train of thought.—*C. A.*

THE ATMOSPHERIC TIDE AT MILWAUKEE, WIS.

By the late I. A. LAPHAM.

Atmospheric tides are caused or modified by several influences :

1. The attraction of the moon varying with its declination and distance, and its position with regard to the sun.
2. The attraction of the sun.
3. The earth's orbital motion.
4. The earth's diurnal rotation.
5. Changes of atmospheric temperature.
6. Changes in the amount of atmospheric moisture.

In order to ascertain whether the hourly oscillations of the barometer, indicating a tidal wave in the atmosphere, could, as suggested by Maj. R. S. Williamson, be determined by a single day's observations, I made such observations at Milwaukee, commencing at 7 a. m., October 19, 1868. The moon reached the meridian three hours after the sun—had 18° south declination—the sun's declination 10° south. The abnormal oscillation was manifested by a pretty uniform rise of the barometer during nearly the whole day. The temperature did not vary much during the twenty-four hours, being at 7 a. m., 41°; at 2 p. m., 45°; at its maximum, 49°; at 9 p. m., 43°; and at its minimum depression during the night, 41°. But little of the atmospheric tide can, therefore, be attributed to the change of temperature between the day and night. The sky continued to be uniformly cloudy, wind moderate, the air contained from 61 to 77 per cent of the amount of aqueous vapor it was capable of holding; the pressure of vapor was equivalent to from 0.181 to 0.198 inches of mercury. So the wave could not have been much affected by changes in the hygrometrical condition of the atmosphere.

Hence, these observations were favorable for showing the effect of astronomical causes upon the atmosphere.

The observations for November 14-15, 1868, were taken under circumstances equally favorable with those of October for avoiding the effect of great changes of temperature and moisture. They show a much more prominent morning maximum, which may be owing to the nearness of the sun and moon. The evening maximum is scarcely discernible. The same nodes are observed upon comparison with observations at Thunder Bay and Toronto, but at a different time, being about noon and midnight. The great depression between 2 p. m. and 10 p. m. must be owing to some uneliminated, abnormal, fluctuation.

The remainder of the manuscript is summed up in Tables 1 and 2, compiled in March.

In 1869, Professor Lapham sums up the results of his observations "taken hourly one day in each month at the time of the new moon," and concludes, "Thus it appears that when the latitude of the moon is north, the atmospheric tide is considerably less than when it is south."

Apparently Professor Lapham returned to this subject in 1870, as we find among his papers a few additional sheets, giving hourly readings for six days, June 28–July 4. But in this latter series very few actual observations were taken between 10 p. m. and 6 a. m., inclusive, so that he filled in this portion of the record by simple interpolation. The figures given by Professor Lapham for these days are reproduced in Tables 3 and 4, to which we have added a column of means. The hourly corrections in Table 4 are deduced from the actual observations of Table 3 by assuming, with Williamson, that the total change in pressure from 7 a. m. to the next following 7 a. m. has gone on at a uniform rate. After applying to each hourly observation its proportional part of this daily change, the observations are said to have been reduced "to level." The average of the 24 observations, as thus reduced, gives the mean pressure for the day, and the difference between this mean and the individual observations corrected to level gives the departure due to diurnal tide, or the diurnal periodic variation of pressure freed from the irregular variations due to highs and lows.

Of course, the few days of hourly observations secured by Professor Lapham during these years can not give us a satisfactory determination of the diurnal period, but they afford a very good illustration of an effort to carry out the suggestions made by Major Williamson. During these same years, 1868–70, and subsequently, the officers of the battalion of engineers stationed at Willetts Point, New York Harbor, maintained a series of hourly observations and published the results in successive general orders issued at that post. A similar record was kept at Jefferson Barracks, Mo., and occasionally there was printed a comparison between the horary curves at Jefferson Barracks, Willetts Point, and the Dudley Observatory, Albany, where Prof. G. W. Hough kept his self-registering and printing barometer in activity. This publication is now very rare, only one copy being on file in the office of the Chief of Engineers, United States Army.

In general, however, it should be stated that this method of determining the diurnal period of pressure, or temperature, has not been widely adopted by meteorologists, and the exhaustive studies on this subject by Professor Hann have been based upon the older and less laborious methods of procedure.

Figures in italic are interpolated values.—*C. A.*

TABLE 1.—*Hourly barometrical observations at Milwaukee, Wis.*

Hour.	1868.			1869.									Mean.
	Oct. 19–20.	Nov. 14–15.	Dec. 13–14.	Jan. 13–14.	Feb. 11–12.	Mar. 13–14.	Apr. 11–12.	May 11–12.	June 9–10.	July 9–10.	Aug. 7–8.	Sept. 6–7.	
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*
7 a. m	29.440	29.545	29.713	29.422	29.526	29.225	29.548	29.992	29.319	29.230	29.721	29.263	29.495
8 a. m	*29.455*	29.544	29.705	29.431	29.546	29.221	29.549	29.989	29.309	29.241	29.734	29.262	29.499
9 a. m	29.471	29.541	29.703	29.450	29.547	29.211	29.550	*29.985*	29.301	29.240	29.735	29.290	29.502
10 a. m	29.474	29.532	29.698	29.460	29.557	29.213	29.556	29.981	29.282	29.240	29.734	29.300	29.502
11 a. m	*29.478*	29.514	29.667	29.456	29.558	29.197	29.555	29.976	26.264	29.242	29.738	29.306	29.496
12 noon	*29.481*	29.482	29.638	29.439	29.539	29.184	29.549	29.960	29.253	29.245	29.721	29.314	29.484
1 p. m	29.485	29.467	29.601	29.426	29.522	29.158	29.545	29.958	29.243	29.244	29.720	29.326	29.475
2 p. m	29.492	29.449	29.588	29.412	29.501	29.125	29.534	29.950	29.213	29.222	29.700	20.318	29.459
3 p. m	29.497	29.454	29.586	29.421	29.500	29.098	29.525	29.935	29.215	29.298	29.688	29.321	29.461
4 p. m	*29.506*	29.450	29.591	29.429	29.500	29.079	29.519	29.940	29.227	29.189	29.665	29.328	29.452
5 p. m	29.515	29.442	29.569	29.434	*29.483*	29.060	29.516	29.945	29.236	29.173	29.650	29.336	29.447
6 p. m	29.527	29.438	29.552	29.441	29.463	29.044	29.506	*29.950*	29.248	29.166	29.645 29.635	29.345	29.443
7 p. m	*29.537*	29.444	29.531	*29.444*	29.446	29.019	29.499	29.956	29.275	29.143	29.633 29.635	29.347	29.440
8 p. m	29.548	29.436	29.500	29.446	29.428	29.021	29.502	29.959	29.294	29.152	29.630	29.355	29.439
9 p. m	29.557	29.434	29.480	29.441	29.398	28.996	29.504	29.976	29.311	19.154	29.633	29.359	29.437
10 p. m	29.564	29.430	29.447	29.442	29.373	28.966	29.508	29.971	29.325	29.156	29.623	29.367	29.431
11 p. m	29.569	29.451	29.401	29.447	29.339	28.930	29.500	29.963	29.318	29.149	29.620	29.359	29.420
12 midnight	29.575	29.464	29.372	29.434	29.321	28.916	29.484	*29.958*	29.309	29.135	29.620	29.349	29.411
1 a. m	29.574	*29.466*	*29.328*	29.438	29.305	28.911	29.472	29.953	29.297	29.124	29.615	29.345	29.402
2 a. m	29.576	29.468	29.286	29.453	29.310	*28.906*	29.462	*29.955*	29.288	29.088	29.616	29.345	29.396
3 a. m	29.578	29.465	29.269	29.456	29.292	28.923	29.444	29.956	29.280	*29.052*	29.624	29.341	29.390
4 a. m	29.574	29.464	29.256	29.465	29.273	29.000	29.437	29.946	29.289	29.026	29.628	29.333	29.391
5 a. m	29.565	29.461	29.243	29.459	29.289	29.062	29.430	29.946	29.300	28.985	29.629	29.332	29.392
6 a. m	29.568	29.470	29.239	29.456	29.297	29.124	29.434	29.950	29.322	28.942	29.639	29.335	29.398
7 a. m	29.573	29.475	29.240	29.451	29.320	29.150	29.438	29.941	29.338	28.900	29.638	29.328	29.399
Mean													29.440

TABLE 2.—*Atmospheric tide at Milwaukee, Wis., as shown by hourly barometric observations made on one day in each month.*

Hour.	1868.			1869.									Mean.
	Oct. 19–20.	Nov. 14–15.	Dec. 13–14.	Jan. 12–13.	Feb. 11–12.	Mar. 13–14.	Apr. 11–12.	May 11–12.	June 9–10.	July 9–10.	Aug. 7–8.	Sept. 6–7.	
	Inch.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*
7 a. m	+.022	−.041	+.013	+.006	+.003	−.123	+.010	−.007	−.051	+.084	−.016	+.034	−.006
8 a. m	+.013	−.043	+.001	−.002	−.026	−.122	+.005	−.006	−.040	+.059	−.032	+.032	−.013
9 a. m	+.002	−.043	−.016	−.020	−.036	−.116	−.001	−.004	−.031	+.047	−.037	+.012	−.020
10 a. m	+.004	−.037	−.031	−.028	−.055	−.121	−.012	−.002	−.012	+.033	−.039	+.005	−.025
11 a. m	+.006	−.022	−.020	−.023	−.064	−.108	−.015	.000	+.007	+.017	−.047	+.002	−.022
12 noon	+.008	+.007	.011	−.005	−.053	−.098	−.014	+.014	+.009	+.000	−.033	−.003	−.015
1 p. m	+.010	+.020	+.007	+.009	−.044	−.075	−.014	+.014	+.030	−.012	−.036	−.013	−.008
2 p. m	+.008	+.035	.000	+.024	−.032	−.045	−.008	+.020	+.061	−.004	−.019	−.002	+.003
3 p. m	+.008	+.027	−.017	+.017	−.039	−.021	−.004	+.031	+.059	+.006	−.011	−.002	+.005
4 p. m	+.006	+.028	−.042	+.010	−.048	−.005	−.002	+.026	+.048	+.001	+.009	−.007	+.002
5 p. m	+.002	+.033	−.040	+.006	−.040	+.011	−.004	+.019	+.040	+.004	+.020	−.012	+.003
6 p. m	−.004	+.034	−.042	.000	−.028	+.023	+.002	+.012	+.029	−.003	+.032	−.018	+.003
7 p. m	−.009	+.025	−.041	−.002	−.020	+.045	+.004	+.003	+.003	+.006	+.028	−.018	+.002
8 p. m	−.015	+.030	−.031	−.002	−.011	+.040	−.003	−.002	−.016	−.017	+.030	−.023	−.001
9 p. m	−.018	+.029	−.030	+.004	+.010	+.062	−.010	−.021	−.032	−.032	+.024	−.024	−.003
10 p. m	−.020	+.030	−.017	+.004	+.026	+.089	−.019	−.018	−.045	−.049	+.031	−.029	−.001
11 p. m	−.020	+.006	+.009	.000	+.052	+.122	−.015	−.012	−.037	−.055	+.030	−.019	+.005
12 midnight	−.020	−.010	+.019	+.014	+.061	+.133	−.004	−.009	−.027	−.055	+.027	−.006	+.011
1 a. m	−.013	−.014	+.043	+.012	+.069	+.135	+.004	−.006	−.015	−.057	+.028	+.001	+.016
2 a. m	−.010	−.019	+.065	−.002	+.055	+.137	+.009	−.010	−.005	−.035	+.024	+.003	+.018
3 a. m	−.005	−.019	+.063	−.004	+.065	+.116	+.022	−.014	+.004	−.013	+.012	+.010	+.020
4 a. m	+.005	−.021	+.056	−.012	+.075	+.036	+.025	−.006	−.004	−.001	+.004	+.021	+.015
5 a. m	+.018	−.021	+.049	−.005	+.051	−.029	+.027	−.008	−.014	+.024	−.000	+.024	+.010
6 a. m	+.021	−.033	+.034	.000	+.034	−.094	+.019	−.014	−.036	+.066	−.014	+.024	+.001

TABLE 3.—*Hourly barometrical observations at Milwaukee, Wis.*

Hour.	1870.					
	June 28–29.	June 29–30.	June 30, July 1.	July 1–2.	July 2–3.	July 3–4.
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*
7 a. m	29.367	29.277	29.044	39.194	29.429	29.366
8 a. m	29.369	29.264	29.031	29.218	29.434	*29.353*
9 a. m	29.358	29.262	29.021	29.226	*29.438*	29.340
10 a. m	29.350	29.263	28.996	29.255	29.443	29.331
11 a. m	29.346	29.273	28.970	29.280	29.431	29.328
12 noon	29.326	29.248	28.959	28.283	*29.438*	29.320
1 p. m	29.311	29.201	28.934	29.316	29.436	29.309
2 p. m	29.291	29.189	28.935	29.318	29.430	29.298
3 p. m	29.279	29.183	28.900	29.341	*29.423*	29.300
4 p. m	29.271	29.147	28.861	29.326	*29.415*	29.280
5 p. m	29.273	29.149	28.845	*29.332*	*29.408*	29.295
6 p. m	29.284	29.134	28.871	29.338	*29.401*	*29.277*
7 p. m	29.308	29.135	29.002	*29.341*	*29.394*	29.260
8 p. m	29.307	29.137	28.997	*29.344*	*29.386*	*29.257*
9 p. m	29.304	29.137	*29.015*	*29.339*	29.379	29.245
10 p. m	29.301	*29.125*	*29.033*	*29.348*	*29.378*	*29.237*
11 p. m	29.298	*29.113*	*29.051*	*29.357*	*29.377*	*29.229*
12 midnight	29.294	*29.102*	*29.069*	*29.366*	*29.376*	*29.221*
1 a. m	29.290	*29.093*	*29.087*	*29.374*	*29.375*	*29.213*
2 a. m	29.286	*29.083*	*30.105*	*29.383*	*29.373*	*29.204*
3 a. m	29.282	*29.074*	*29.123*	*29.392*	*29.372*	*29.195*
4 a. m	29.278	*29.068*	*29.141*	*29.400*	*29.370*	*29.187*
5 a. m	29.274	*29.055*	*29.158*	*29.409*	*29.369*	*29.179*
6 a. m	29.270	29.049	*29.176*	*29.419*	*29.367*	*29.171*
7 a. m	29.264	29.044	29.194	29.429	29.366	29.163

TABLE 4.—*Atmospheric tide at Milwaukee, Wis.*

Hour.	1870.						6-day mean, June 28 to July 4.
	June 28–29.	June 29–30.	June 30, July 1.	July 1–2.	July 2–3.	July 3–4.	
	Inch.	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*
7 a. m	−.013	−.009	−.102	+.024	+.003	−.003	−.017
8 a. m	−.019	−.006	−.083	+.010	−.005	+.002	−.017
9 a. m	−.012	−.013	−.067	+.012	−.012	+.006	−.014
10 a. m	−.009	−.024	−.036	−.007	−.019	+.007	−.015
11 a. m	−.009	−.044	−.003	−.023	−.010	+.001	−.015
12 noon	+.007	−.029	+.014	−.016	−.015	+.001	−.006
1 p. m	+.017	+.009	+.045	−.039	−.020	+.003	+.002
2 p. m	+.033	+.011	+.051	−.031	−.017	+.006	+.009
3 p. m	+.041	+.007	+.092	−.045	−.013	−.003	+.013
4 p. m	+.045	+.034	+.137	−.020	−.008	+.009	+.033
5 p. m	+.039	+.019	+.160	−.016	−.003	−.019	+.030
6 p. m	+.024	+.027	+.140	−.012	+.001	−.005	+.029
7 p. m	−.004	+.017	+.015	−.006	+.006	+.003	+.005
8 p. m	−.007	+.005	+.029	+.001	+.012	−.003	+.006
9 p. m	−.009	−.005	+.014	+.016	+.016	+.001	+.005
10 p. m	−.011	−.003	+.003	+.021	+.015	.000	+.004
11 p. m	−.012	−.002	−.009	−.017	+.013	.000	−.005
12 midnight	−.013	+.001	−.021	−.018	+.017	−.001	−.006
1 a. m	−.013	.000	−.033	−.020	+.010	−.001	−.010
2 a. m	−.013	.000	−.044	−.021	+.009	−.001	−.012
3 a. m	−.014	.000	−.056	−.021	+.007	.000	−.014
4 a. m	−.014	−.004	−.068	−.023	+.007	−.001	−.017
5 a. m	−.014	−.001	−.078	−.024	+.005	−.001	−.019
6 a. m	−.015	−.004	−.090	−.024	+.004	−.002	−.022

\+ add to, — subtract from, observed height to produce the mean.

THE WEATHER OF THE MONTH.

By Mr. WM. B. STOCKMAN, Chief, Division of Meteorological Records.

PRESSURE.

The distribution of mean atmospheric pressure is graphically shown on Chart VIII and the average values and departures from normal are shown in Tables I and VI.

The mean pressure for the month was high over the States south of New England and the Lake region, with the crest over western Virginia and eastern West Virginia. It was low over eastern California and the southern Plateau region, with the minimum pressure over southern Arizona.

The mean pressure was above the normal over the entire country, the greatest departures from the normal occurring over southwestern Virginia, north-central Colorado, northwestern Arizona, western Nevada, and east-central California.

The mean pressure increased over that of July, 1904, except in the southern portions of Alabama and Mississippi, southeastern Louisiana, and Florida, except the extreme northeastern portion, the greatest increase occurring over the southern Plateau region.

TEMPERATURE OF THE AIR.

The distribution of maximum, minimum, and average surface temperatures is graphically shown by the lines on Chart V.

The mean temperature for the month was above the normal in eastern and central Kentucky, eastern Tennessee, western North Carolina, northeastern Georgia, northwestern Texas, eastern New Mexico, western Nebraska, southwestern South Dakota, Wyoming, central and western Montana, Idaho, southwestern Utah, and the Pacific States, except on the immediate coast from central California northward; elsewhere the mean temperature was below the normal, the greatest minus departures, as a rule, occurring in the northeastern and north-central States, and the greatest plus departures over the northern Plateau regions and southern California.

The average temperatures for the several geographic districts and the departures from the normal values are shown in the following table:

Average temperatures and departures from normal.

Districts.	Number of stations.	Average temperatures for the current month.	Departures for the current month.	Accumulated departures since January 1.	Average departures since January 1.
		°	°	°	°
New England	8	65.3	− 1.5	−15.9	− 2.0
Middle Atlantic	12	72.1	− 0.9	−16.7	− 2.1
South Atlantic	10	77.6	− 0.3	−11.8	− 1.5
Florida Peninsula*	8	80.6	− 0.8	+ 0.7	+ 0.1
East Gulf	9	78.8	− 0.7	− 7.5	− 0.9
West Gulf	7	80.3	− 0.3	+ 2.0	+ 0.2
Ohio Valley and Tennessee	11	73.9	− 0.6	−16.3	− 2.0
Lower Lake	8	67.4	− 2.1	−20.8	− 2.6
Upper Lake	10	63.4	− 2.5	−21.9	− 2.7
North Dakota*	8	64.7	− 1.6	−20.6	− 2.6
Upper Mississippi Valley	11	70.3	− 2.5	−22.3	− 2.8
Missouri Valley	11	72.1	− 0.9	− 9.6	− 1.2
Northern Slope	7	68.2	+ 0.3	+ 2.5	+ 0.3
Middle Slope	6	74.3	− 0.3	+ 3.5	+ 0.4
Southern Slope*	6	78.8	− 0.1	+ 9.6	+ 1.2
Southern Plateau*	13	75.6	− 1.0	+ 4.0	+ 0.5
Middle Plateau*	8	70.1	+ 0.3	+ 2.6	+ 0.3
Northern Plateau*	12	70.7	+ 2.5	+15.2	+ 1.9
North Pacific	7	60.8	− 0.6	− 1.2	− 0.2
Middle Pacific	5	63.8	− 0.9	+ 1.5	+ 0.2
South Pacific	4	73.0	+ 1.6	+ 5.5	+ 0.7

*Regular Weather Bureau and selected voluntary stations.

In Canada.—Prof. R. F. Stupart says:

The temperature was below the average throughout the Dominion, if we except a few isolated localities, where the average was just maintained, and in Cariboo, in northern British Columbia, where it was exceeded by 1°. The most pronounced negative departures occurred in Ontario, varying from 2° to as much as 6° in some localities. Western Quebec was from 2° to 3° below; the greater part of the Northwest Territories from 2° to 4° below, and southwestern Nova Scotia 3° below.

By geographic districts the temperature was above the normal in the northern slope, northern and middle Plateau, and south Pacific regions, and below the normal in all other districts.

Maximum temperatures of 100°, or higher, were reported from portions of the following States: Texas, Oklahoma and Indian Territory, interior California, western Arizona, southern Nevada, southwestern Idaho, interior Oregon, and eastern and central Washington; and 110°, or higher, from southeastern California and western Arizona.

Freezing temperatures occurred at scattered places in the Rocky Mountain regions.

The minimum temperature during August, since the establishment of the station, was equaled at Jupiter, Fla., Galveston, Tex., Columbia and Charleston, S. C., and Harrisburg, Pa.; and was lower by 1° at Alpena, Mich., and Binghamton, N. Y.; 3° at Denver, Colo.; 5° at Elkins, W. Va., and 7° at Richmond, Va.

PRECIPITATION.

The distribution of total monthly precipitation is shown on Chart III.

The distribution of precipitation was very irregular. Excesses ranging from 2 to 5 inches were reported from the interior of the South Atlantic States, southern portion of the east Gulf States, southeastern New York, southeastern Connecticut, northern Missouri, southern Minnesota, eastern South Dakota, the panhandle of Texas, and the northern portion of Arizona. The greatest deficiencies ranged from 2.0 to 3.3 inches and were reported from central Arkansas, the southwestern portions of Virginia and Ohio, eastern Maryland, and the extreme southern portion of New Jersey.

Average precipitation and departure from the normal.

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percentage of normal.	Current month.	Accumulated since Jan. 1.
		Inches.		Inches.	Inches.
New England	8	4.57	118	+0.7	− 1.3
Middle Atlantic	12	3.59	78	−1.0	− 6.4
South Atlantic	10	6.16	97	−0.2	− 8.6
Florida Peninsula*	8	7.30	107	+0.5	− 0.7
East Gulf	9	6.84	126	+1.4	−11.0
West Gulf	7	2.07	58	−1.5	− 5.3
Ohio Valley and Tennessee	11	2.78	80	−0.7	− 6.5
Lower Lake	8	2.75	93	−0.2	+ 1.9
Upper Lake	10	2.71	93	−0.2	− 1.6
North Dakota*	8	1.45	94	−0.1	+ 0.5
Upper Mississippi Valley	11	4.02	133	+1.0	− 0.4
Missouri Valley	11	3.97	129	+0.9	+ 1.5
Northern Slope	7	1.06	84	−0.2	+ 0.2
Middle Slope	6	2.54	104	+0.1	+ 3.1
Southern Slope*	6	2.71	96	−0.1	+ 0.2
Southern Plateau*	13	2.93	205	+1.5	− 0.9
Middle Plateau*	8	1.09	158	+0.4	+ 2.4
Northern Plateau*	12	0.25	56	−0.2	0.0
North Pacific	7	0.27	31	−0.6	0.0
Middle Pacific	5	0.03	100	0.0	+ 4.6
South Pacific	4	0.06	100	0.0	− 0.5

*Regular Weather Bureau and selected voluntary stations.

In Canada.—Professor Stupart says:

The rainfall was below the average from Vancouver Island to Manitoba, except in a few isolated localities, noticeably at Calgary and Minnedosa, both these places recording a small positive departure. A slight deficiency occurred on the western shores of the Georgian Bay and Lakes Huron and Erie, also in counties from Peterboro to Carlton, but in Ontario, generally, the rainfall was greatly in excess of the average, as it likewise was in the Province of Quebec.

In the Maritime Provinces the average amount was exceeded by 2.6 inches at St. John, and at Halifax by 2.2 inches, but elsewhere, with few exceptions, the average quantity was not recorded. This was especially the case in portions of Prince Edward Island.

By geographic districts the precipitation was normal in the middle and south Pacific districts; above normal in New England, Florida Peninsula, east Gulf States, upper Mississippi and Missouri valleys, and the middle slope and middle and

southern Plateau regions. In the remaining districts it was below the normal.

The precipitation during the month was the lowest for August since the establishment of the station at North Head, and Tacoma, Wash., and the greatest at Elkins, W. Va., Flagstaff, Ariz., Hannibal, Mo., Taylor and Amarillo, Tex., Eastport, Me., Pocatello, Idaho, and Modena, Utah.

HAIL.

The following are the dates on which hail fell in the respective States:

Arizona, 2, 6, 8, 13, 15, 21, 23–25, 29, 31. California, 12, 16, 17, 24, 26, 27. Colorado, 3–9, 13–17, 19, 21, 23, 26, 27, 29–31. Connecticut, 2, 8. Idaho, 28. Illinois, 4, 10, 13, 15, 17, 21. Indiana, 10. Iowa, 6, 9, 17, 21, 22. Kansas, 9, 18. Kentucky, 1, 14–16, 25. Massachusetts, 1, 2. Michigan, 13, 15, 21. Minnesota, 1, 3, 8, 19, 20, 21. Mississippi, 1, 5, 26. Missouri, 9, 13, 15, 20. Montana, 11, 20, 28, 29, 31. Nebraska, 1–5, 7–9, 15, 17, 30, 31. Nevada, 1, 8, 12, 13, 15, 22, 26, 27. New Hampshire, 15. New Jersey, 8. New Mexico, 14, 24, 25, 28. New York, 14, 17. North Carolina, 6, 13. North Dakota, 8, 11, 18, 19. Ohio, 6, 10, 13, 14, 16. Oregon, 2, 5, 28. Pennsylvania, 5, 8, 16, 17, 18, 22. South Carolina, 15, 23, 26. South Dakota, 2, 3, 8, 9, 18–21, 28. Tennessee, 7, 14, 15. Texas, 21, 27. Utah, 7, 12, 21, 26, 27, 31. Virginia, 16, 18. Washington, 28. West Virginia, 1, 14. Wisconsin, 12, 15, 16, 21. Wyoming, 6, 8, 10, 11, 13, 17, 18, 20, 27, 28, 30.

HUMIDITY.

The relative humidity was normal in the Florida Peninsula, west Gulf States, lower Lakes, and middle Pacific region; below the normal in New England, upper Lakes, and north Pacific region, and above the normal in all other districts.

The averages by districts appear in the subjoined table:

Average relative humidity and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
	%			%	
New England	80	— 2	Missouri Valley	69	+ 2
Middle Atlantic	77	+ 1	Northern Slope	57	+ 5
South Atlantic	83	+ 1	Middle Slope	68	+ 9
Florida Peninsula	80	0	Southern Slope	65	+ 4
East Gulf	83	+ 3	Southern Plateau	54	+ 8
West Gulf	75	0	Middle Plateau	47	+12
Ohio Valley and Tennessee	73	+ 1	Northern Plateau	38	+ 5
Lower Lake	71	0	North Pacific	76	— 3
Upper Lake	74	— 1	Middle Pacific	60	0
North Dakota	65	+ 1	South Pacific	67	+ 1
Upper Mississippi Valley	73	+ 3			

CLEAR SKY AND CLOUDINESS.

The cloudiness was normal in the South Atlantic States and northern slope; below the normal in New England, Florida Peninsula, west Gulf States, lower Lakes, and southern slope and northern Plateau regions. In the remaining districts it was above the average.

The distribution of clear sky is graphically shown on Chart IV, and the numerical values of average daylight cloudiness, both for individual stations and by geographic districts, appear in Table I.

The average cloudiness for the various districts, with departures from the normal, are shown in the following table:

Average cloudiness and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	4.8	— 0.2	Missouri Valley	4.2	+ 0.1
Middle Atlantic	5.2	+ 0.2	Northern Slope	3.7	0.0
South Atlantic	5.2	0.0	Middle Slope	4.5	+ 0.7
Florida Peninsula	4.8	— 0.4	Southern Slope	4.4	— 0.4
East Gulf	5.9	+ 1.0	Southern Plateau	4.4	+ 1.0
West Gulf	4.3	— 0.1	Middle Plateau	4.7	+ 1.9
Ohio Valley and Tennessee	4.7	+ 0.2	Northern Plateau	2.6	— 0.4
Lower Lake	4.1	— 0.4	North Pacific	4.5	+ 0.5
Upper Lake	5.0	+ 0.2	Middle Pacific	4.7	+ 0.9
North Dakota	4.1	+ 0.2	South Pacific	2.8	+ 0.3
Upper Mississippi Valley	4.2	+ 0.1			

WIND.

The maximum wind velocity at each Weather Bureau station for a period of five minutes is given in Table I, which also gives the altitude of Weather Bureau anemometers above ground.

Following are the velocities of 50 miles and over per hour registered during the month:

Maximum wind velocities.

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Buffalo, N. Y	20	58	sw.	Mount Tamalpais, Cal	27	52	nw.
Do	25	51	sw.	Point Reyes Light, Cal	28	55	nw.
Cleveland, Ohio	25	50	nw.	Do	29	53	nw.
Columbus, Ohio	13	60	nw.	St. Louis, Mo	19	50	w.
Duluth, Minn	19	51	nw.	St. Paul, Minn	20	102	nw.
Knoxville, Tenn	19	52	sw.	Sand Key, Fla	18	50	se.
Lewiston, Idaho	28	55	w.	Sault Ste. Marie, Mich	25	50	w.
Minneapolis, Minn	20	84	nw.				

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table IV, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

Thunderstorms.—Reports of 7291 thunderstorms were received during the current month as against 7174 in 1903 and 9378 during the preceding month.

The dates on which the number of reports of thunderstorms for the whole country was most numerous were: 1st, 348; 2d, 338; 17th, 320; 15th, 314; 21st, 310.

Reports were most numerous from: Nebraska, 381; Florida, 323; Missouri, 314; Georgia, 280; Utah, 277; Colorado, 270.

Auroras.—The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be the four preceding and following the dates of full moon, viz, August 21 to 29, inclusive.

In Canada: Thunderstorms were reported from Sydney, 2; Halifax, 2; Grand Manan, 2, 15; Yarmouth, 11; Father Point, 6; Quebec, 5, 6, 14, 16, 17, 25, 28; Montreal, 5, 16, 17, 23, 25; Kingston, 8, 10, 25; Toronto, 2, 7, 13, 16, 22, 25; White River, 4, 5, 12, 13, 24, 25; Port Stanley, 10, 13, 16, 25; Saugeen, 13, 15, 16, 22; Parry Sound, 16, 25; Port Arthur, 16, 24; Minnedosa, 3; Qu'Appelle, 3, 18, 19; Swift Current, 19; Calgary, 18; Banff, 7, 18; Edmonton, 10, 27; Barkerville, 27, 31; Hamilton, Bermuda, 2, 13, 24, 25.

Auroras were reported from Grand Manan, 3, 9; Father Point, 3, 31; Quebec, 3; Montreal, 3; Swift Current, 1.

DESCRIPTION OF TABLES AND CHARTS.

By Mr. WM. B. STOCKMAN, Chief, Division of Meteorological Records.

For description of tables and charts see page 136 of REVIEW for March, 1904.

TABLE I.—*Climatological data for Weather Bureau stations, August, 1904.*

Stations.	Elevation of instruments.			Pressure, in inches.			Temperature of the air, in degrees Fahrenheit.												Precipitation, in inches.			Wind.									
	Barometer above sea level, feet.	Thermometers above ground.	Anemometer above ground.	Actual, reduced to mean of 24 hours.	Sea level, reduced to mean of 24 hrs.	Departure from normal.	Mean max. + mean min. ÷ 2.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.	Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Total.	Departure from normal.	Days with .01, or more.	Total movement, miles.	Prevailing direction.	Maximum velocity: Miles per hour.	Maximum velocity: Direction.	Maximum velocity: Date.	Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.
New England.							65.3	− 1.5										80	4.57	+ 0.7										4.8	
Eastport	76	69	82	29.93	30.01	+ .05	60.0	− 0.6	76	18	68	47	30	52	25	55	52	82	6.10	+ 2.6	12	6,304	s.	40	s.	20	12	12	7	5.3	
Portland, Me.	103	81	117	29.91	30.03	+ .05	64.6	− 2.2	89	1	72	50	13	57	23	59	56	78	3.64	− 0.1	10	6,372	s.	48	se.	20	15	7	9	4.8	
Concord	298	70	79	29.72	30.04	+ .06	65.2	− 2.3	88	1	76	41	30	54	37	...	...	...	4.45	+ 0.8	12	3,473	se.	21	sw.	25	14	8	9	5.0	
Northfield	876	16	60	29.11	30.05	+ .07	60.8	− 2.1	82	1	73	35	30	48	38	57	54	80	3.54	− 0.4	15	5,724	s.	29	nw.	22	9	13	9	5.1	
Boston	125	115	181	29.91	30.04	+ .05	68.7	− 0.4	89	1	76	52	27	61	25	62	59	74	2.19	− 2.2	10	6,512	sw.	34	s.	20	16	8	7	4.3	
Nantucket	12	43	82	30.04	30.05	+ .06	65.9	− 1.8	77	7	71	56	31	61	13	63	61	87	2.25	− 0.9	12	8,377	sw.	35	se.	20	10	11	10	5.3	
Block Island	26	11	46	30.03	30.06	+ .07	67.3	− 0.7	77	7	72	54	27	62	15	64	62	85	6.80	+ 3.3	11	9,506	sw.	45	se.	20	15	11	5	4.4	
Narragansett	...	9	38	...	...	...	66.8	− 1.6	82	7	74	48	24	60	24				5.89	+ 2.0	11	...	s.	...	...	...	18	4	9		
New Haven	106	116	154	29.94	30.05	+ .06	68.6	− 1.4	84	7	77	50	27	60	26	64	60	77	6.27	+ 1.2	11	5,728	s.	29	s.	20	16	10	5	3.8	
Mid. Atlantic States.							72.1	− 0.9										77	3.59	− 1.0										5.2	
Albany	97	102	115	29.94	30.04	+ .06	69.4	− 1.1	89	1	79	49	27	60	30	62	59	74	2.78	− 1.3	10	5,186	s.	30	s.	25	17	10	4	3.9	
Binghamton	875	79	90	29.14	30.06	+ .07	65.7	− 1.5	87	1	77	41	27	54	34	...	...	...	3.12	− 0.9	10	3,745	nw.	26	sw.	20	11	13	7	5.3	
New York	314	108	350	29.72	30.05	+ .05	72.2	− 0.1	85	7	79	57	27	65	21	66	63	77	7.13	+ 2.4	10	7,390	s.	42	nw.	26	11	8	12	5.6	
Harrisburg	374	94	104	29.67	30.06	+ .05	70.6	− 1.5	87	22	80	50	27	62	25	64	60	73	2.95	− 1.6	8	3,763	w.	29	ne.	17	10	10	11	5.4	
Philadelphia	117	116	184	29.94	30.06	+ .06	73.4	− 0.4	88	6	81	57	27	66	25	66	61	69	4.43	+ 0.1	11	6,611	sw.	30	sw.	20	10	9	12	5.4	
Scranton	805	111	119	29.22	30.07	+ .07	68.2	......	91	1	78	44	27	58	31	61	58	72	4.69	......	12	4,578	sw.	24	nw.	26	10	11	10	5.5	
Atlantic City	52	39	48	30.01	30.06	+ .06	72.4	+ 0.6	88	6	78	55	27	66	21	67	65	79	4.87	+ 0.1	10	5,528	sw.	26	s.	20	11	5	15	5.5	
Cape May	17	47	51	30.06	30.08	+ .08	72.0	− 1.2	85	17	77	53	27	67	24	67	...	...	2.65	− 2.1	6	4,999	s.	24	s.	20	10	18	3	4.7	
Baltimore	123	69	117	29.92	30.05	+ .04	73.6	− 1.3	89	1	82	55	27	65	29	66	63	72	1.95	− 2.1	9	4,467	n.	25	w.	22	10	3	18	6.1	
Washington	112	59	76	29.95	30.06	+ .05	72.3	− 2.3	92	22	81	52	29	63	33	66	64	78	2.97	− 1.0	12	3,545	n.	28	n.	22	10	11	10	5.3	
Cape Henry	18	11	58	30.05	30.07	+ .07	75.8	− 0.6	90	20	82	62	25	70	20	...	...	...	4.59	− 1.0	10	8,529	s.	40	n.	28	14	10	7	4.7	
Lynchburg	681	83	88	29.35	30.08	+ .06	74.4	− 0.9	93	22	84	53	29	65	35	68	66	82	2.70	− 1.3	11	2,206	sw.	20	ne.	1	11	16	4	4.5	
Norfolk	91	102	111	29.98	30.07	+ .07	76.0	− 0.6	92	22	83	62	29	69	22	71	69	84	4.24	− 1.9	12	5,796	ne.	24	sw.	8	6	11	14	6.4	
Richmond	144	82	90	29.92	30.07	+ .06	75.6	......	94	22	84	56	29	67	31	...	...	...	3.83	......	12	3,355	sw.	19	n.	1	11	14	6	4.6	
Wytheville	2,293	40	47	27.76	30.12	+ .11	69.3	− 1.2	85	22	79	44	28	59	33	64	62	86	2.32	− 2.2	14	2,621	w.	19	w.	20	10	16	5	5.1	
S. Atlantic States.							77.6	− 0.3										83	6.16	− 0.2										5.2	
Asheville	2,255	53	75	27.80	30.09	+ .07	70.8	+ 0.3	86	21	80	48	28	61	30	63	61	81	3.55	− 1.1	16	3,074	se.	20	n.	7	6	17	8	5.9	
Charlotte	773	68	76	29.27	30.09	+ .07	75.7	− 0.4	92	22	84	55	27	67	23	69	68	86	10.31	+ 5.0	19	3,481	sw.	29	sw.	15	8	12	11	6.1	
Hatteras	11	12	47	30.07	30.08	+ .08	77.4	0.0	88	23	82	67	30	72	17	73	72	86	5.36	− 1.0	11	8,812	sw.	30	w.	5	18	8	5	3.7	
Raleigh	376	71	79	29.68	30.07	+ .06	76.9	+ 1.2	95	22	86	54	28	68	30	70	67	80	5.51	− 0.7	14	3,704	sw.	25	ne.	26	3	14	9	5.6	
Wilmington	78	82	90	29.98	30.06	+ .06	77.6	− 0.6	95	23	85	61	29	70	25	72	71	87	6.77	− 0.7	16	4,525	sw.	38	w.	18	7	19	5	5.3	
Charleston	48	14	92	30.04	30.09	+ .08	79.8	− 0.7	93	22	86	62	28	73	19	73	71	80	6.62	− 1.0	16	6,018	s.	29	sw.	4	5	17	9	5.7	
Columbia, S. C.	351	167	175	29.70	30.07	+ .06	77.7	− 2.1	95	22	87	56	27	68	26	70	68	82	7.69	+ 0.8	18	4,835	sw.	40	w.	15	7	15	9	5.7	
Augusta	180	89	97	29.88	30.07	+ .06	80.2	+ 0.8	99	23	91	60	28	70	27	72	70	80	6.62	+ 1.4	16	3,311	s.	38	w.	15	9	12	10	5.4	
Savannah	65	81	89	30.02	30.09	+ .08	79.4	− 0.9	93	18	87	63	28	72	22	72	71	84	6.46	− 1.3	21	4,620	sw.	36	sw.	6	11	15	5	4.8	
Jacksonville	43	101	129	30.03	30.08	+ .07	80.4	− 0.7	93	21	88	68	14	73	22	73	71	81	2.74	− 3.8	11	6,230	s.	42	nw.	13	15	11	5	4.3	
Florida Peninsula.							80.9	− 1.2										80	6.44	+ 0.1										4.8	
Jupiter	28	10	48	30.05	30.08	+ .08	80.0	− 1.0	89	29	86	68	8	74	17	75	74	83	5.79	+ 0.2	15	6,453	se.	35	se.	10	7	22	2	5.1	
Key West	22	10	53	30.03	30.05	+ .07	82.2	− 1.7	91	29	88	72	9	77	15	75	73	73	4.24	− 0.5	13	6,417	e.	31	se.	9	12	18	1	4.4	
Sand Key	25	40	71	30.00	30.03	......	81.4	......	93	16	85	68	10	78	15	...	...	...	2.38	......	11	9,785	e.	50	se.	18	11	17	3	4.6	
Tampa	34	60	67	30.04	30.07	+ .07	80.6	− 0.8	94	21	89	68	9	72	21	73	72	84	9.29	+ 0.5	18	3,827	se.	30	se.	7	6	19	6	5.2	
East Gulf States.							78.8	− 0.7										83	6.84	+ 1.4										5.9	
Atlanta	1,174	190	216	28.87	30.08	+ .07	75.6	− 0.9	92	23	83	58	28	68	21	69	67	84	8.74	+ 4.0	14	5,504	nw.	44	nw.	15	2	18	11	6.7	
Macon	370	93	99	29.68	30.08	+ .07	78.2	......	95	23	87	60	28	69	25	...	...	...	7.99	......	14	3,177	sw.	30	nw.	15	8	10	13	6.3	
Pensacola	56	79	96	30.00	30.06	+ .08	79.6	− 0.8	91	22	85	69	8	74	18	...	...	...	10.54	+ 2.2	19	5,584	nw.	27	sw.	7	8	13	10	5.9	
Birmingham	700	136	143	29.32	30.08	+ .09	77.8	− 2.0	94	23	86	59	28	69	24	...	...	...	2.78	− 2.7	12	4,080	sw.	30	ne.	15	10	9	12	5.2	
Mobile	57	88	96	30.00	30.06	+ .08	79.7	− 0.6	93	23	87	68	12	73	23	73	71	81	8.72	+ 1.8	17	4,205	s.	24	se.	11	2	19	10	6.4	
Montgomery	223	100	112	29.82	30.04	+ .05	79.0	− 0.8	94	23	88	62	29	70	23	72	71	85	6.81	+ 2.7	16	3,599	s.	41	e.	3	7	15	9	5.6	
Meridian	375	84	93	29.67	30.05	+ .07	78.4	+ 0.6	93	23	88	63	29	69	25	...	...	...	4.97	+ 0.5	11	2,900	nw.	26	ne.	15	8	16	7	5.3	
Vicksburg	247	62	74	29.78	30.03	+ .05	79.4	− 0.7	94	23	88	66	28	71	23	74	73	88	6.33	+ 2.8	12	3,637	sw.	31	e.	26	13	10	8	5.0	
New Orleans	51	88	121	30.00	30.05	+ .07	81.3	− 0.2	94	21	88	70	25	74	23	74	72	78	5.83	− 0.2	11	4,656	sw.	31	se.	9	5	14	12	6.3	
West Gulf States.							80.3	− 0.3										75	2.07	− 1.5										4.3	
Shreveport	249	77	84	29.78	30.04	+ .07	80.6	− 0.7	97	24	90	64	28	71	26	71	68	75	1.94	− 0.2	10	3,636	se.	24	se.	7	10	16	5	4.4	
Fort Smith	457	79	94	29.55	30.02	+ .05	79.0	+ 1.3	96	25	89	60	28	69	30	70	67	73	2.38	− 1.4	7	4,576	e.	30	e.	6	11	18	2	3.6	
Little Rock	357	93	100	29.68	30.05	+ .07	78.8	+ 0.6	96	25	88	62	26	70	25	70	67	74	2.10	− 2.0	8	4,149	ne.	26	nw.	1	11	16	4	4.4	
Corpus Christi	20	48	53	30.00	30.02	+ .09	81.0	− 0.4	88	19	86	73	27	76	15	75	73	81	0.52	− 2.6	2	7,469	se.	28	se.	20	11	14	6	4.7	
Fort Worth	670	106	114	29.34	30.04	+ .10	81.0	......	98	25	91	67	7	71	27	...	...	...	3.26	......	4	6,309	s.	40	se.	1	25	5	1	2.7	
Galveston	54	106	112	29.99	30.05	+ .09	81.2	− 2.0	91	28	86	68	26	77	20	75	73	78	4.03	− 1.5	12	6,219	s.	43	ne.	26	16	11	4	3.6	
Palestine	510	73	79	29.51	30.04	+ .07	79.6	− 0.8	96	26	89	64	28	70	26	71	69	76	1.58	− 1.1	7	3,002	s.	28	s.	1	8	17	6	5.5	
San Antonio	701	80	91	29.28	30.00	+ .07	82.1	− 0.1	97	26	93	66	24	71	28	71	67	70	1.97	− 1.9	3	4,278	se.	24	nw.	2	9	21	1	3.9	
Taylor	583	55	63	29.42	30.03	+ .08	80.5	......	96	26	91	66	29	70	27	...	...	...	2.16	......	2	5,031	se.	31	se.	1	0	29	2	5.9	
Ohio Val. and Tenn.							73.9	− 0.6										73	2.78	− 0.7										4.7	
Chattanooga	762	106	112	29.29	30.09	+ .09	76.0	+ 0.1	92	25	85	60	28	67	24	70	68	82	5.03	+ 1.2	18	3,633	w.	36	e.	1	7	15	9	5.7	
Knoxville	1,004	35	88	29.03	30.07	+ .06	75.3	+ 0.5	90	24	85	57	28	66	27	69	67	82	3.92	− 0.2	11	3,609	sw.	52	sw.	19	2	23	6	6.2	
Memphis	397	146	154	29.65	30.07	+ .09	78.5	− 0.2	92	25	86	62	28	71	23	72	69	75	2.24	− 1.4	6	5,452	sw.	45	nw.	1	13	14	4	3.8	
Nashville	546	122	134	29.50	30.07	+ .07	78.3	+ 0.8	95	25	88	60	27	69	26	69	66	73	2.80	− 0.6	10	3,567	nw.	24	n.	1	11	15	5	4.6	
Lexington	989	75	102	29.02	30.06	+ .05	74.2	+ 0.2	90	25	83	54	27	65	26	...	...	...	2.44	− 1.1	11	5,719	sw.	33	nw.	25	15	12	4	3.9	
Louisville	525	114	136	29.49	30.07	+ .07	76.8	+ 0.5	95	25	87	54	27	66	30	...	...	...	2.11	− 1.4	7	4,971	sw.	26	sw.	20	12	12	7	4.4	
Evansville	431	72	82	29.59	30.05	+ .06	75.6	......	92	25	85	54	27	67	26	66	61	66	1.07	......	6	4,115	sw.	26	sw.	20	15	14	2	3.7	
Indianapolis	822	154	164	29.18	30.06	+ .06	71.4	− 2.2	89	13	82	53	23	61	29	62	57	65	2.48	− 0.8	6	5,359	nw.	38	s.	20	13	12	6	4.5	
Cincinnati	628	152	160	29.39	30.05	+ .04	75.0	0.0	94	25	85	56	27	65	32	64	57	62	0.41	− 3.3	5	4,397	sw.	26	w.	25	13	9	9	4.5	
Columbus	824	173	190	29.20	30.06	+ .05	71.0	− 1.3	92	25	82	51	27	60	31	62	57	67	3.18	− 0.1	7	6,653	sw.	60	nw.	13	14	11	6	4.4	
Pittsburg	842	336	352	29.16	30.05	+ .04	70.7	− 2.1	90	25	80	49	27	61	30	62	57	68	2.36	− 0.8	11	5,614	nw.	46	w.	22	11	16	4	4.5	
Parkersburg	638	77	84	29.41	30.09	+ .08	72.4	− 1.2	92	25	84	50	28	61	40	64	60	71	1.82	− 1.5	10	3,252	n.	29	n.	25	14	12	5	4.2	
Elkins	1,940	41	50	28.08	30.10	+ .08	67.2	− 2.1	88	1	80	42	27	54	36	61	59	87	4.59	+ 1.3	13	2,034	w.	23	n.	14	5	12	14	6.4	
Lower Lake Region.							67.4	− 2.1										71	2.75	− 0.2										4.1	
Buffalo	767	178	206	29.22	30.04	+ .05	66.1	− 2.4	80	21	73	50	19	59	25	60	56	71	3.41	+ 0.2	10	9,154	sw.	58	sw.	20	13	7	11	5.4	
Oswego	335	76	91	29.66	30.02	+ .03	65.7	− 2.5	87	25	73	49	19	58	27	61	58	77	2.92	+ 0.3	12	6,213	w.	28	s.	5	17	10	4	3.7	
Rochester	523	81	102	29.48	30.04	+ .05	67.2	− 1.2	89	25	77	48	19	58	28	60	56	72	2.56	− 0.5	10	5,474	sw.	31	sw.	20	8	14	9	5.2	
Syracuse	597	97	113	29.41	30.04	+ .05	66.5	......	85	1	75	48	31	58	26	...	...	...	2.91	......	10	5,885	s.	38	w.	22	15	9	7	4.3	
Erie	713	92	102	29.28	30.05	+ .04	66.4	− 3.1	87	25	74	51	9	59	29	60	56	68	2.07	− 1.2	8	6,841	s.	36	w.	25	16	8	7	4.4	
Cleveland	762	190	201	29.24	30.05	+ .05	67.2	− 2.4	90	25	74	51	27	60	30	62	58	74	2.29	− 0.8	8	9,623	se.	50	nw.	25	16	7	8	4.0	
Sandusky	629	62	70	29.38	30.06	+ .05	69.0	− 2.0	88	25	77	53	27	61	29	...	...	...	2.33	− 0.8	9	5,409	sw.	34	nw.	25	19	9	3	2.9	
Toledo	628	120	127	29.38	30.06	+ .06	69.0	− 1.8	87	13	79	50	27	59	29	60	55	66	3.20	+ 0.5	8	6,454	sw.	39	sw.	20	20	8	3	3.4	
Detroit	730	153	193	29.26	30.05	+ .04	68.2	− 1.5	85	13	77	49	26	59	24	60	55	67	3.20	+ 0.5	11	7,281	sw.	40	sw.	20	16	11	4	3.9	
Upper Lake Region.							63.4	− 2.5										74	2.71	− 0.2										5.0	
Alpena	609	63	80	29.37	30.03	+ .03	61.2	− 2.3	84	21	72	38	30	51	33	56	53	76	1.90	− 1.6	8	7,004	nw.	40	w.	25	10	15	6	5.1	
Escanaba	612	40	48	29.36	30.01	+ .02	60.4	− 4.2	85	14	70	40	8	51	36	57	54	79	2.17	− 1.6	9	5,426	s.	30	nw.	25	12	9	10	5.3	
Grand Rapids	707	127	165	29.29	30.05	+ .06	65.9	− 4.3	86	21	76	47	26	56	30	58	53	69	2.26	− 0.1	7	7,321	s.	47	w.	21	12	13	6	4.6	
Houghton	668	66	74	29.26	29.98	+ .01	62.0	......	85	27	71	40	29	53	34	...	...	...	2.34	......	12	5,071	w.	30	w.	25	14	6	11	5.1	
Marquette	734	76	116	29.21	30.01	+ .03	61.1	− 2.5	87	14	70	45	29	53	30	55	50	68	3.04	+ 0.2	11	8,033	nw.	42	sw.	12	8	13	10	5.5	
Port Huron	638	70	120	29.38	30.07	+ .07	65.6	− 1.4	83	1	75	44	26	56	29	59	55	72	3.56	+ 1.0	7	7,848	sw.	33	n.	25	15	10	6	4.8	
Sault Ste. Marie	614	40	61	29.33	29.99	.00	58.5	− 2.3	79	14	68	39	8	49	30	54	51	80	2.35	− 0.4	8	5,768	nw.	50	w.	25	12	11	8	5.1	
Chicago	823	241	274	29.18	30.06	+ .06	68.3	− 2.6	90	21	75	55	8	61	24	60	56	69	4.00	+ 1.0	8	10,672	ne.	42	sw.	9	12	15	4	4.3	
Milwaukee	681	124	142	29.32	30.06	+ .06	66.6	− 1.7	85	12	76	51	30	58	27	60	56	74	3.96	+ 1.2	9	7,514	sw.	36	sw.	4	13	8	10	4.9	
Green Bay	617	49	86	29.37	30.03	+ .04	65.2	− 1.5	86	21	76	44	30	55	28	59	56	75	1.41	− 1.2	10	7,336	sw.	38	n.	15	9	13	9	5.5	
Duluth	1,133	11	47	28.79	29.99	+ .02	61.2	− 2.5	85	14	70	44	22	52	30	55	51	75	2.47	− 0.9	11	9,021	ne.	51	nw.	19	9	17	5	4.9	

TABLE I.—*Climatological data for Weather Bureau stations, August, 1904*—Continued.

Stations.	Elevation of instruments: Barometer above sea level, feet.	Thermometers above ground.	Anemometer above ground.	Pressure, in inches: Actual, reduced to mean of 24 hours.	Sea level, reduced to mean of 24 hrs.	Departure from normal.	Temperature of the air, in degrees Fahrenheit: Mean max. + mean min. ÷ 2.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.	Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches: Total.	Departure from normal.	Days with .01, or more.	Wind: Total movement, miles.	Prevailing direction.	Maximum velocity: Miles per hour.	Direction.	Date.	Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.
North Dakota.							65.0	−1.4										65	0.74	−1.2										4.1	
Moorhead	935	54	60	29.00	30.01	+.05	63.9	−1.3	90	15	76	40	22	52	43	57	53	73	0.96	−1.7	7	6,121	se.	28	nw.	21	16	12	3	3.7	
Bismarck	1,674	16	29	28.28	29.99	+.05	65.4	−2.1	95	11	78	40	7	52	48	56	50	64	0.68	−1.3	7	6,375	n.	40	nw.	24	20	5	6	3.8	
Williston	1,875	14	44	28.00	29.94	+.01	65.8	−0.7	100	2	81	39	23	50	49	53	45	58	0.57	−0.6	4	6,339	n.	40	nw.	24	15	8	8	4.9	
Upper Miss. Valley.							70.3	−2.5										73	4.02	+1.0										4.2	
Minneapolis	......	99	208	......	......	......	66.2	−2.9	88	12	75	46	10	58	28	......	......	......	5.61	+2.4	9	9,192	s.	84	nw.	20	8	12	11	......	
St. Paul	837	171	179	29.09	29.99	+.02	66.0	−3.1	88	14	74	47	10	58	30	59	55	70	5.41	+2.1	9	7,035	nw.	102	nw.	20	17	6	8	4.5	
La Crosse	714	71	87	29.28	30.04	+.06	66.9	−3.2	91	24	78	43	8	56	32	......	......	......	3.67	+0.4	8	5,014	s.	26	nw.	25	15	11	5	4.4	
Davenport	606	71	79	29.39	30.02	+.04	70.0	−2.8	90	13	80	52	8	60	30	64	61	76	3.60	0.0	10	4,560	sw.	27	n.	21	17	9	5	3.7	
Des Moines	861	84	99	29.15	30.06	+.09	70.2	−1.8	91	24	80	49	26	60	37	63	59	73	2.60	−0.7	7	5,196	sw.	30	sw.	24	19	6	6	3.3	
Dubuque	698	100	117	29.30	30.04	+.06	68.8	−2.8	91	12	80	45	8	58	31	60	55	66	2.58	−0.6	9	4,646	nw.	24	nw.	25	11	13	7	5.2	
Keokuk	614	63	78	29.38	30.02	+.04	72.0	−2.5	91	21	81	53	23	63	29	64	61	76	4.63	+1.8	12	4,433	nw.	30	nw.	21	18	7	6	3.3	
Cairo	356	87	93	29.69	30.06	+.07	76.0	−1.0	93	25	84	58	27	68	22	69	67	80	2.59	−0.2	11	4,244	n.	40	n.	14	6	20	5	5.0	
Springfield, Ill.	644	82	93	29.37	30.05	+.06	71.2	−2.2	90	21	81	51	8	61	30	63	60	71	2.63	+0.3	8	5,129	s.	28	nw.	21	14	12	5	4.3	
Hannibal	534	75	109	29.48	30.05	+.07	71.7	−2.5	92	13	82	50	27	62	30	......	......	......	8.23	+6.0	12	5,227	sw.	49	ne.	13	15	12	4	3.6	
St. Louis	567	208	217	29.45	30.05	+.06	74.4	−2.4	92	13	83	57	8	66	23	66	62	70	2.62	−0.9	10	6,352	ne.	50	w.	19	13	11	7	4.3	
Missouri Valley.							72.1	−0.9										69	3.97	+0.9										4.2	
Columbia, Mo.	784	11	84	29.22	30.03	+.06	73.0	−3.0	94	13	85	50	23	61	32	......	......	......	6.17	+3.6	14	4,330	s.	34	nw.	15	16	12	3	3.9	
Kansas City	963	78	95	29.05	30.06	+.09	74.3	−1.4	97	15	84	55	26	65	26	67	63	74	7.49	+3.6	10	4,765	se.	36	nw.	21	18	6	7	3.7	
Springfield, Mo	1,324	98	104	28.68	30.06	+.09	73.8	−0.2	89	24	82	56	23	65	23	67	64	78	4.66	+1.0	11	5,782	se.	26	sw.	19	20	6	5	3.3	
Topeka	......	85	89	......	......	......	74.4	−0.4	98	15	85	51	26	64	28	......	......	......	2.99	−0.9	9	5,010	s.	36	nw.	21	14	12	5	4.1	
Lincoln	1,189	75	84	28.77	30.01	+.06	72.2	−1.4	97	15	83	50	26	61	33	64	60	72	2.39	−0.9	8	6,119	s.	39	w.	9	13	12	6	4.6	
Omaha	1,105	115	121	28.87	30.03	+.07	72.4	−1.3	93	14	82	54	22	63	26	64	61	71	4.45	+1.1	11	5,059	s.	33	nw.	5	16	6	9	4.3	
Valentine	2,598	47	54	27.34	30.02	+.08	70.4	+0.1	100	14	84	43	22	57	40	60	54	65	3.08	+1.0	9	7,147	s.	36	s.	2	13	11	7	4.8	
Sioux City	1,135	96	164	28.81	30.00	+.05	69.8	−1.8	96	14	80	46	10	59	35	......	......	......	2.68	−0.5	11	7,918	s.	42	s.	3	12	10	9	4.7	
Pierre	1,572	43	50	28.34	29.97	+.03	73.6	+0.8	101	14	87	47	22	60	43	59	51	54	1.09	−0.6	4	5,632	se.	32	n.	3	10	13	8	5.0	
Huron	1,306	56	67	28.62	30.00	+.05	68.2	−0.2	100	14	82	40	22	54	44	59	54	68	4.65	+2.1	5	8,391	se.	37	se.	8	14	10	7	4.4	
Yankton	1,233	42	49	28.69	29.98	+.03	70.7	−1.1	98	14	83	45	10	59	37	......	......	......	4.00	+0.9	12	4,697	e	32	w.	21	17	9	5	3.9	
Northern Slope.							68.2	+0.3										57	1.06	−0.2										3.7	
Havre	2,505	11	44	27.38	29.97	+.06	66.2	+0.6	96	13	82	38	25	50	48	54	46	58	0.51	−0.9	7	5,197	e.	37	nw.	18	24	5	2	2.0	
Miles City	2,371	42	50	27.48	29.94	+.01	70.0	−1.7	100	13	86	42	25	54	48	63	60	75	0.44	−0.6	4	3,522	w.	36	nw.	15	23	5	3	3.1	
Helena	4,110	88	94	25.87	29.98	+.04	68.6	+2.1	95	13	82	40	21	55	38	51	38	39	0.72	+0.1	4	5,301	sw.	32	sw.	29	19	11	1	2.9	
Kalispell	2,965	45	51	26.94	29.94	+.01	64.3	......	91	9	80	37	22	49	42	50	40	49	1.15	......	6	4,224	w.	23	sw.	19	17	12	2	3.3	
Rapid City	3,234	46	50	26.65	29.95	+.02	70.0	+0.1	99	14	84	41	22	56	46	57	48	54	1.36	0.0	10	5,298	w.	38	nw.	8	18	5	8	3.5	
Cheyenne	6,088	56	64	24.15	30.01	+.09	65.5	+0.5	87	10	79	39	22	52	42	52	45	57	0.87	−0.7	8	6,110	nw.	36	sw.	20	9	16	6	5.3	
Lander	5,372	26	36	24.76	30.01	+.09	65.4	+0.5	89	14	83	31	22	48	51	53	46	58	0.24	−0.4	5	1,990	sw.	32	sw.	29	12	19	0	4.3	
Yellowstone Park	6,200	11	47	24.02	30.03	+.10	60.1	......	85	14	76	30	21	45	42	47	37	52	1.11	......	10	4,734	sw.	27	sw.	10	13	18	0	4.0	
North Platte	2,821	43	52	27.15	30.03	+.09	71.5	+0.1	97	24	85	43	22	58	41	62	58	72	3.25	+0.8	8	5,187	s.	34	nw.	2	9	18	4	4.8	
Middle Slope.							74.3	−0.3										68	2.54	+0.1										4.5	
Denver	5,291	79	151	24.85	30.03	+.11	69.9	−0.2	94	10	84	40	22	56	41	56	49	59	0.60	−0.9	9	5,041	s.	35	nw.	19	8	17	6	5.2	
Pueblo	4,685	80	86	25.39	30.00	+.09	71.6	−0.7	92	24	85	49	22	58	36	59	54	65	2.63	+0.6	11	4,539	se.	35	nw.	12	10	17	4	4.9	
Concordia	1,398	42	47	28.58	30.02	+.07	74.2	−0.2	96	15	85	50	26	64	31	66	63	72	3.15	+0.5	6	4,458	se.	30	nw.	15	13	12	6	4.5	
Dodge	2,509	44	54	27.46	30.01	+.08	75.1	−0.1	98	28	87	51	22	63	32	65	60	69	3.99	+1.1	10	7,003	s.	34	s.	14	16	10	5	4.3	
Wichita	1,358	78	86	28.63	30.03	+.08	76.0	−0.5	97	15	86	53	26	66	29	67	64	72	1.42	−1.6	10	4,820	s.	24	sw.	24	14	12	5	3.8	
Oklahoma	1,214	79	86	28.75	29.99	+.05	78.8	−3.2	99	29	89	59	26	69	32	69	65	70	3.46	+0.8	7	6,603	s.	32	n.	25	11	14	6	4.5	
Southern Slope.							77.6	+1.0										65	3.06	+0.6										4.4	
Abilene	1,738	45	54	28.22	29.98	+.06	80.7	+0.5	98	19	91	65	9	70	31	69	64	64	1.42	−1.2	4	4,973	se.	28	w.	19	14	9	8	4.6	
Amarillo	3,676	10	49	26.35	30.00	+.08	74.4	+1.5	94	29	86	53	26	62	29	63	58	66	4.69	+2.3	7	7,848	s.	30	n.	21	13	15	3	4.3	
Southern Plateau.							77.3	−0.8										54	2.62	+1.1										4.4	
El Paso	3,762	10	110	26.22	29.90	+.06	78.8	−0.2	95	1	90	61	7	67	30	62	52	48	2.24	+0.4	13	6,307	e.	44	ne.	22	11	17	3	4.4	
Santa Fe	7,013	33	39	23.42	29.96	+.07	66.8	+0.5	84	14	77	51	26	56	27	54	47	57	2.31	−0.3	18	4,403	se.	26	ne.	9	12	18	1	4.3	
Flagstaff	6,907	12	25	23.49	29.94	+.10	62.3	−4.1	81	7	74	46	30	51	32	54	51	76	8.77	+5.5	23	2,992	nw.	24	nw.	21	0	18	13	6.9	
Phoenix	1,108	50	56	28.72	29.83	+.04	88.0	−0.2	107	10	100	68	17	76	28	71	64	52	1.61	+0.7	8	3,293	e.	36	e.	17	11	17	3	4.6	
Yuma	141	16	46	29.68	29.82	+.06	89.8	−0.9	107	10	101	71	23	79	30	75	69	57	0.69	+0.3	4	4,553	se.	32	ne.	11	22	6	3	2.5	
Independence	3,910	51	58	26.01	29.91	+.10	78.0	+0.4	95	7	90	57	29	66	33	58	44	36	0.07	−0.2	1	5,733	nw.	38	se.	22	13	15	3	4.0	
Middle Plateau.							71.8	+0.4										47	0.90	+0.2										4.7	
Carson City	4,720	82	92	25.34	29.94	+.10	68.9	+2.1	92	7	84	44	21	53	39	54	44	50	0.17	0.0	3	4,238	w.	38	s.	5	13	11	7	4.4	
Winnemucca	4,344	59	70	25.65	29.97	+.09	70.2	−0.4	95	7	86	37	21	54	46	54	45	47	0.54	+0.5	7	5,188	sw.	44	s.	25	17	7	7	3.7	
Modena	5,479	10	43	24.70	29.93	+.07	70.6	+0.9	94	6	84	44	22	58	38	56	48	54	2.52	+1.3	11	7,468	w.	37	sw.	22	4	21	6	6.1	
Salt Lake City	4,366	105	110	25.66	29.95	+.04	74.2	−0.4	94	9	86	46	22	62	40	56	44	38	0.28	−0.4	6	4,272	se.	36	s.	11	13	15	3	4.1	
Grand Junction	4,608	43	51	25.45	29.98	+.08	75.2	−0.4	95	6	88	51	22	63	36	58	49	48	1.00	−0.2	11	4,039	se.	26	w.	20	7	20	4	5.2	
Northern Plateau.							73.0	+2.0										38	0.29	0.0										2.6	
Baker City	3,471	53	59	26.49	30.01	+.06	68.2	+2.1	94	13	83	39	21	53	40	51	37	37	0.39	+0.2	3	4,146	nw.	29	n.	28	17	11	3	3.4	
Boise	2,739	61	68	27.15	29.94	+.01	75.0	+2.8	103	13	91	44	21	59	45	56	41	35	0.23	0.0	2	2,734	nw.	30	sw.	12	19	9	3	3.4	
Lewiston	757	10	51	29.15	29.95	.00	76.6	+2.0	106	5	94	49	31	60	45	......	......	......	0.22	−0.4	2	3,940	e.	55	w.	28	27	3	1	1.3	
Pocatello	4,482	46	54	25.54	29.96	+.04	70.8	+1.2	93	6	85	42	22	56	40	53	38	38	0.66	+0.2	6	5,813	e.	28	se.	12	14	16	1	3.1	
Spokane	1,929	101	110	27.96	29.97	+.02	70.5	+1.5	100	5	87	43	24	54	44	53	38	38	0.15	−0.2	2	3,464	sw.	24	w.	19	19	10	2	2.6	
Walla Walla	1,000	65	71	28.90	29.95	−.01	76.6	+2.4	104	5	91	51	24	63	39	60	49	42	0.08	−0.1	1	3,641	s.	26	sw.	19	29	2	0	1.9	
N. Pac. Coast Reg.							60.8	−0.6										76	0.27	−0.6										4.8	
North Head	211	11	56	29.88	30.10	+.07	55.2	−3.9	78	25	59	48	3	52	27	53	52	92	0.02	−1.0	1	10,346	nw.	40	nw.	21	6	7	18	7.5	
Port Crescent	259	12	29	29.81	30.09	+.07	54.0	−2.7	80	4	61	39	24	47	32	......	......	......	0.77	0.0	3	3,227	w.	12	ne.	12	15	8	8	4.3	
Seattle	123	114	151	29.95	30.08	+.08	63.6	−0.7	90	4	73	48	24	54	32	57	52	71	0.07	−0.5	3	2,884	w.	16	nw.	3	19	8	4	3.1	
Tacoma	213	113	120	29.83	30.06	+.04	62.9	−1.3	90	4	74	46	24	52	34	......	......	......	0.07	−0.7	2	3,035	n.	18	sw.	19	7	19	5	5.0	
Tatoosh Island	86	7	57	29.99	30.09	+.09	53.8	−2.0	69	4	58	45	16	50	19	52	52	95	0.73	−1.7	4	7,306	sw.	42	s.	26	6	7	18	7.0	
Portland, Oreg.	154	68	96	29.88	30.04	+.03	67.4	+1.5	95	4	80	48	31	55	38	58	51	62	0.20	−0.4	1	3,694	nw.	18	nw.	19	22	7	2	3.0	
Roseburg	518	56	60	29.47	30.02	+.02	68.5	+2.3	98	4	85	44	23	52	42	56	48	58	0.01	−0.2	1	2,586	nw.	14	nw.	6	26	4	1	1.4	
Mid. Pac. Coast Reg.							63.8	−0.9										60	0.03	0.0										4.7	
Eureka	62	62	80	29.99	30.06	+.06	54.6	−1.3	65	28	58	48	21	51	13	52	50	87	T.	−0.1	0	3,990	nw.	20	nw.	29	2	10	19	7.4	
Mount Tamalpais	2,375	11	18	27.55	29.97	+.04	71.8	......	92	6	79	53	28	65	21	54	36	32	0.03	......	1	10,125	nw.	52	nw.	27	24	7	0	1.6	
Red Bluff	332	50	56	29.54	29.87	+.01	81.9	+0.8	108	6	97	59	23	67	36	62	46	35	0.00	0.0	0	3,135	se.	24	n.	20	28	3	0	1.3	
Sacramento	69	106	117	29.82	29.89	+.04	72.0	−0.7	96	6	87	53	4	57	38	60	54	60	0.07	+0.1	2	6,195	s.	24	s.	8	25	5	1	1.6	
San Francisco	155	161	167	29.84	30.01	+.09	57.1	−1.6	75	30	62	49	6	52	23	53	52	88	0.06	0.0	2	9,674	w.	36	w.	31	17	6	8	4.4	
Point Reyes Light	490	7	50	......	......	......	53.4	−1.5	62	1	57	48	10	50	10	......	......	......	T.	−0.2	0	15,298	nw.	55	nw.	28	2	6	23	8.5	
Southeast Farallon	30	9	17	29.97	30.00	......	54.4	......	59	1	56	51	23	53	4	......	......	......	T.	......	0	11,066	nw.	40	nw.	20	2	8	21	7.8	
S. Pac. Coast Reg.							73.0	+1.6										67	0.06	0.0										2.8	
Fresno	330	67	70	29.53	29.87	+.05	82.8	+1.1	109	7	100	58	29	66	40	61	43	32	0.00	0.0	0	5,014	nw.	23	nw.	22	25	6	0	1.7	
Los Angeles	338	116	123	29.57	29.93	+.05	73.1	+2.7	91	28	83	55	1	63	27	64	60	76	0.17	+0.1	2	3,939	w.	24	ne.	13	18	9	4	3.3	
San Diego	87	94	102	29.84	29.93	+.04	71.0	+2.1	82	27	76	63	2	66	14	66	63	81	T.	−0.1	0	4,165	nw.	17	nw.	28	22	4	5	3.0	
San Luis Obispo	201	47	54	29.75	29.97	+.03	65.2	+0.4	88	26	77	45	29	53	38	57	54	78	0.06	+0.1	1	2,984	nw.	16	w.	1	23	4	4	3.4	
West Indies.																															
Basseterre	29	41	54	29.98	30.01	+.05	80.3	......	87	18	85	68	24	75	13	75	73	77	5.89	......	17	8,077	e.	34	e.	24	5	14	12	6.3	
Bridgetown	30	57	65	29.94	29.97	+.05	80.2	+1.2	88	2	86	71	2	75	17	75	73	79	6.66	+0.2	19	5,448	e.	22	e.	17	13	7	11	5.2	
Cienfuegos	52	62	67	29.96	30.01	+.06	80.3	......	92	30	89	69	16	72	21	73	71	80	3.74	......	14	5,116	ne.	24	se.	2	14	16	1	3.9	
Grand Turk	11	6	20	30.03	30.04	+.06	82.0	......	90	29	89	68	22	75	20	......	......	......	1.42	......	16	......	e.	......	......	......	12	10	9	5.2	
Havana	57	87	105	29.97	30.03	+.07	79.8	−2.4	88	7	86	70	27	73	18	......	......	......	4.54	−1.5	13	7,626	e.	38	e.	14	21	8	2	2.6	
Puerto Principe	352	55	62	29.67	30.03	+.08	79.4	......	91	3	88	68	4	70	23	73	72	87	5.60	......	18	6,144	e.	39	e.	4	13	14	4	4.2	
San Juan	82	48	90	29.94	30.02	+.05	79.0	−2.4	86	3	84	68	12	74	16	75	73	80	9.87	+4.0	21	9,468	e.	36	e.	6	7	14	10	5.8	
Santiago de Cuba	82	46	52	29.91	30.00	+.05	80.0	......	94	5	88	69	24	72	21	73	70	77	4.71	......	16	4,974	n.	38	e.	24	4	16	11	6.4	

TABLE II.—*Climatological record of voluntary and other cooperating observers, August, 1904.*

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Alabama.	°	°	°	*Ins.*	*Ins.*
Anniston	95	55	75.6	5.27	
Ashville	95	57	76.3	5.92	
Benton				5.70	
Bermuda	98	64	79.0	7.72	
Boligee	97	60	80.0	2.88	
Bridgeport				4.05	
Burkeville				7.42	
Calera				6.92	
Camphill	97			5.30	
Cedar Bluff				4.53	
Citronelle	95	66	79.6	7.60	
Clanton	100	60	76.9	11.11	
Cordova	96	55	78.4	3.72	
Daphne	95	67	80.4	10.76	
Decatur	95	61	78.9	2.91	
Delmar	98	59	77.6	2.65	
Demopolis				3.77	
Eufaula	91	64	78.0	7.79	
Evergreen	95	65	79.2	6.14	
Florence *a*				1.38	
Florence *b*	98	59	78.8	1.38	
Fort Deposit	99	56	77.3		
Gadsden	96	57	78.3	5.66	
Goodwater	97	58	77.2	13.17	
Greensboro	94[e]	63[e]	79.0[e]	2.78	
Hamilton	96[f]	56[f]	78.8[f]	3.52	
Highland Home	97	60	76.0	5.02	
Letohatchie				1.55	
Livingston	94[d]	61[d]	79.2[d]	5.47	
Lock No. 4	96	56	77.7	8.02	
Madison Station	99	61	79.0	3.82	
Maplegrove	95	55	76.9	4.61	
Marion	99	66	81.2	4.13	
Milstead				3.84	
Newbern	101	63	80.2	4.45	
Notasulga				4.07	
Oneonto	92	56	75.9	7.93	
Opelika	95	60	77.5	5.71	
Ozark	95	64	79.3	7.77	
Prattville	93	59	77.6	6.85	
Pushmataha	93	62	78.6	3.85	
Riverton	97	55	78.2	2.86	
Scottsboro	94	59	76.5	3.53	
Selma	98	64	80.7	5.51	
Spring Hill	90	66	79.2	7.19	
Talladega	98	57	78.5	4.86	
Tallassee				8.27	
Thomasville	97	63	80.2	5.84	
Tuscaloosa	98	61	79.6	6.28	
Tuscumbia	95	62	79.4	2.02	
Tuskegee	97	61	79.8	2.03	
Union Springs	92	63	78.9	10.66	
Uniontown	97	58	77.8	4.30	
Valleyhead	98	55	77.2	5.62	
Verbena				9.20	
Wetumpka	97	61	79.8	6.92	
Alaska.					
Killisnoo	70	39	53.6	2.30	
Petersburg	76	34	52.6	2.33	
Sitka	70	40	53.0	3.74	
Skagway	80	31	54.4	0.18	
Arizona.					
Allaire Ranch				3.32	
Arizona Canal Co. Dam	107	69	88.8	2.67	
Aztec	115	63	89.6	0.95	
Benson	108	60	79.4	4.32	
Bisbee	87	59	71.2	5.77	
Blue	92	50	70.2	1.75	
Bowie	98	50	74.9	3.02	
Buckeye	107[e]	68[e]	87.0[e]		
Cassgrande	112	67	90.4	2.83	
Cochise *[1]	100	67	82.1	3.17	
Congress	98	61	81.5	5.05	
Douglas	99	60	78.8	1.68	
Dragoon *[1]	97	70	80.6	3.10	
Dudleyville	100	60	82.6	4.45	
Duncan	103	53	78.4	1.50	
Fort Apache	93	50	70.4	6.66	
Fort Defiance	86	46	64.6	3.34	
Fort Grant	111	60[e]	80.8	0.62	
Fort Huachuca	89	55	73.4	6.94	
Fort Mohave	118	69	92.4	0.38	
Gilabend	112			1.30	
Grand Canyon	90	50	69.2	7.05	
Greaterville	88	54	71.3	3.12	
Greer				6.52	
Holbrook	95	55	73.2	3.30	
Huachuca Reservoir				9.00	
Jerome	92	59	74.8	7.40	
Kingman	99	58	80.0	5.48	
Maricopa	107	69	88.4	1.40	
Mesa	110	67	87.7	2.68	
Mohawk Summit *[1]	114	75	94.2	2.63	
Natural Bridge				3.53	
Oracle	92	66	76.6	3.63	
Oro				2.75	
Parker	114	70	91.6	1.16	
Phoenix	109	67	87.0	1.38	
Arizona—Cont'd.	°	°	°	*Ins.*	*Ins.*
Pinal Ranch				3.94	
Prescott	99	69	82.6	6.74	
St. Johns	96	50	70.6	3.15	
San Carlos	107	64	84.6	2.36	
San Simon	97	62	78.8	4.39	
Sentinel *[1]	112	79	90.1		
Signal	110	66	87.8	2.34	
Superstition				4.08	
Taylor	93	50	72.7	3.26	
Thatcher	102[d]	61[d]	80.2[d]	2.15	
Tombstone	87	58	73.2	4.36	
Tonto		66		2.53	
Tuba	93	49[d]	70.8	1.59	
Tucson	100	65	82.4	2.65	
Upper San Pedro	94	60	77.0		
Vail *[5]	100	66	80.6		
Walnutgrove				4.27	
Wilcox	95	56	76.2	4.65	
Williams	83	49	65.5	4.81	
Yarnell				3.92	
Young	102	51	78.6	6.06	
Arkansas.					
Alco	95	53	76.2	3.10	
Amity	97	50	77.2	1.34	
Arkadelphia	98	53	79.0	0.70	
Arkansas City				2.56	
Batesville	97	54	78.2	1.73	
Beebranch	98	52	76.7	2.65	
Blanchard Springs	95	54	77.9	3.29	
Brinkley	99	54	79.0	2.49	
Camden *a*				1.63	
Camden *b*	96	58	80.0	1.25	
Conway	100	55	79.8	2.23	
Corning	97	50	75.4	2.55	
Dallas	98	55	78.2	2.07	
Dardanelle				4.40	
Des Arc	97	54	78.4	2.84	
Dodd City	100	49	75.2	1.10	
Dutton	90	50	72.2	3.17	
Elon	95[e]	57[e]	79.5[e]	5.43	
Eureka Springs	91	52	74.6	4.86	
Fayetteville	90[j]	59[j]	74.1[j]	3.54	
Forrest City	97	54	78.2	4.72	
Fulton				1.32	
Hardy	101	51	78.2	1.08	
Helena *a*				6.40	
Helena *b*	96	61	79.4	5.80	
Hope	98	57	80.4	1.14	
Howe	101	54	81.0	0.78	
Jonesboro	104	55	80.6	4.58	
Lacrosse	102	54	77.8	1.40	
Lake Village	97	58	79.2	3.32	
Lonoke	103	55	80.0	5.74	
Lutherville	97	49	76.0	2.16	
Malvern	100	54	79.4	1.40	
Mammoth Springs	95	52	77.2	1.73	
Marvell	100	56	79.5	4.34	
Mossville	87	55	72.5	2.40	
Mount Nebo	91	57	76.8	3.76	
New Lewisville	98	55	79.8	2.97	
Newport *a*				1.18	
Newport *b*	105	54	80.8	1.08	
Oregon	95	46	72.8	3.86	
Osceola	99	55	78.8	0.33	
Ozark	100	62	80.1	2.22	
Perry	96	56	79.2	1.65	
Pinebluff	101	57	79.7	2.32	
Pocahontas	101	49	77.8	2.08	
Pond	90	54	75.2	5.22	
Prescott	97	50	79.8	3.51	
Princeton	99	52	79.0	1.73	
Rison	99	49	77.2	2.48	
Russellville	96	54	78.0	3.34	
Silversprings	90	51	74.1	5.62	
Spielerville	97	59	78.6	1.82	
Stuttgart	98	54	79.1	3.20	
Texarkana	96	52	79.6	3.43	
Warren	99	52	80.4	1.14	
Wiggs	98	48	77.0	2.47	
Winchester	98	56	80.4	2.03	
Witts Springs	91	51	73.2	5.12	
California.					
Alturas				0.11	
Azusa	99	51	76.0	0.95	
Bagdad	108	70	92.1	1.40	
Bakersfield	108	59	83.7	0.13	
Barstow	108	54	82.5	T.	
Bear Valley				0.81	
Berkeley	74	49	59.0	0.07	
Bishop	96	46	72.3	0.67	
Boca *[1]	87	36	62.4	0.00	
Bodie	84	24	55.8	1.46	
Bowman				0.11	
Branscomb	99	41	68.4	0.08	
Brush Creek	106	42	74.0	T.	
Butte Valley				0.90	
Caliente *[1]	106	64	81.4	0.00	
Campbell	86	43	64.6	0.48	
California—Cont'd.	°	°	°	*Ins.*	*Ins.*
Campo				1.59	
Cedarville	100	39	70.7	0.05	
Chico	107	54	81.0	0.00	
Chino *[5]	98	63	80.8	0.26	
Cisco *[1]	78	50	63.6	0.50	
Claremont	101	54	77.0	0.47	
Cloverdale	102	44	70.2	0.04	
Colusa	101	50	75.2	0.00	
Corning *[5]	104	55	80.9	0.00	
Coronado	82	64	70.0	0.00	
Crescent City	68	40	55.0	T.	
Cuyamaca	85	48	65.1	1.25	
Delta	107	54	78.2	0.00	
Dobbins	105[e]	60[e]	82.4[e]	0.02	
Drytown	102	49	74.7	T.	
Durham	106	58	77.0	0.00	
Elcajon	99	64	82.0	T.	
Elmdale	108	45	78.2	T.	
Elsinore	104	52	79.8	1.12	
Escondido	101	49	72.4	0.00	
Folsom	110	54	78.2	0.10	
Fordyce				0.80	
Fort Ross	69	44	57.4	0.00	
Foster				T.	
Georgetown	102	54	77.4	0.05	
Gilroy (near)	93	43	66.6	0.03	
Greenville	102	33	68.6	0.62	
Hanford	108	52	80.6	0.00	
Healdsburg	102[e]	42[e]	68.6[e]	T.	
Hollister	93	43	66.7	0.12	
Idylwild	88	49	69.2	2.45	
Imperial	111	67	91.1	0.48	
Indio				0.33	
Iowa Hill *[1]	93	59	74.8	0.02	
Irvine				T.	
Isabella	106	52	80.8	0.26	
Jamestown	104	48	75.9	0.04	
Kennedy Gold Mine				0.12	
Kentfield				T.	
Laguna Valley				6.95	
Laporte	87	40	65.3	0.58	
Legrande	105	52	78.3	T.	
Lemoncove	111	51	82.6	T.	
Lick Observatory	87	50	72.4	0.05	
Livermore	98	46	69.0	0.32	
Lodi	96	49	71.1	0.03	
Los Gatos	90	48	66.0	0.57	
Magalia	102	51	76.8	T.	
Mammoth	114	69	94.0	0.00	
Marysville	104	49	76.0	0.08	
Merced	109	54	80.2	0.10	
Mercury				T.	
Mills College				0.12	
Milo				0.35	
Milton (near)	100	52	76.0	0.06	
Modesto *[1]	108	60	76.8	0.13	
Mohave	107	66	90.8	0.30	
Mokelumne Hill				0.02	
Montague	105	46	74.4	0.00	
Monterio	100	52	76.4	0.32	
Monterey *[1]	72	48	57.2	0.00	
Mount St. Helena				0.00	
Napa	93	47	65.6	0.08	
Needles	111	74	94.4	0.90	
Nellie				0.90	
Nevada City	97	42	71.0	0.03	
Newcastle	106	52	83.6	0.01	
Newman	106	50	78.8	0.43	
Niles	88	46	65.8	0.48	
Nordhoff				0.30	
North Bloomfield	100	46	74.0	T.	
Oakland	77	51	61.7	0.03	
Ontario (near)	100	53	77.4	0.19	
Orland	111	52	81.6	T.	
Orleans	109	47	77.8	T.	
Oroville (near)	106	54	78.1	T.	
Palermo	107	50	77.5	T.	
Peachland *[5]	87	50	64.0	T.	
Pilot Creek				0.26	
Pine Crest	93	54	70.0	0.03	
Pino Grande	91	46	69.0	0.34	
Placerville	96	44	71.2	0.21	
Point Lobos	68	52	58.8	T.	
Porterville	112	56	81.6	T.	
Poway				T.	
Quincy	[i]93	38	67.6	0.12	
Redding	107	57	81.4	T.	
Redlands	104	51	78.4	0.18	
Reedley	111	52	85.5	T.	
Represa	94	60	76.6	0.09	
Riovista	96	52	70.4	0.20	
Riverside	101	51	77.4	T.	
Rohnerville				0.03	
Rosewood	110	55	79.8	0.00	
Sacramento	92	51	69.4	0.08	
Salinas	79	45	62.8	T.	
Salton	112	77	94.6	2.00	
San Bernardino	104	51	78.6	0.14	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Temperature. (Fahrenheit.) Minimum.	Temperature. (Fahrenheit.) Mean.	Precipitation. Rain and melted snow.	Precipitation. Total depth of snow.
	°	°	°	*Ins.*	*Ins.*
California—Cont'd.					
San Jacinto	86	54	69.2	0.32	
San Jose	88	47	66.2	0.25	
San Leandro	82	47	61.8	0.12	
San Mateo*[1]	86	50	60.8	0.00	
San Miguel*[1]	100	56	76.0	0.00	
San Miguel Island	.....	.....	.....	0.75	
San Rafael	92	43	64.0	0.00	
Santa Barbara	87	52	69.0	0.10	
Santa Clara College	90	43	64.9	0.42	
Santa Cruz	85	43	62.2	0.50	
Santa Maria	83	47	65.2	0.86	
Santa Monica	82	53	68.1	0.12	
Santa Rosa	92	41	64.0	T.	
Shasta	111	55	83.2	0.00	
Sierra Madre	93	55	74.0	0.73	
Sisson	104	40	70.6	T.	
Snedden	.....	.....	.....	1.50	
Sonoma	.....	.....	.....	T.	
Sonora	99	65	82.3	0.02	
Stockton	94	52	71.3	0.12	
Storey	108	52	80.0	0.00	
Summerdale	89	50	69.6	0.40	
Summit	76	58	67.9	0.03	
Susanville	91	39	68.8	0.25	
Tehama*[1]	108	62	83.4	0.00	
Tejon Ranch	100	60	82.4	0.12	
Truckee*[1]	88	38	59.1	T.	
Tulare[c]	108	50	80.7	T.	
Tustin	.....	.....	.....	0.04	
Ukiah	108	43	72.8	0.02	
Upland	94	54	74.5	0.07	
Upperlake	107	43	74.2	T.	
Upper Mattole	.....	.....	.....	0.00	
Vacaville*[1]	102	57	74.3	0.23	
Visalia	110	54	80.6	0.00	
Volcano	114	75	93.8	0.00	
Wasco	110	55	84.2	0.20	
Wheatland	102	52	75.4	0.01	
Willow	105	55	77.8	0.00	
Yosemite	.....	.....	.....	0.24	
Zenia	94	39	68.3	0.00	
Colorado.					
Akron	.....	.....	.....	0.54	
Alford	87	29	62.0	1.08	
Antelope Springs	73	29	53.0	4.13	
Ashcroft	75	28	53.2	3.16	
Blaine	103	54	73.1	2.37	
Boulder	91	46	70.2	1.00	
Boxelder	.....	.....	.....	1.12	
Breckenridge	77	26	52.4	3.98	
Buenavista	.....	.....	.....	0.29	
Burlington	95	40	69.6	4.96	
Canyon	91	44	70.4	4.11	
Castlerock	91	37	66.9	2.95	
Cheesman	86	37	64.3	3.06	
Cheyenne Wells	94	41	70.5	4.89	
Clearview	70	37	52.6	3.72	
Collbran	90	34	67.3	1.36	
Colorado Springs	85	45	65.6	2.39	
Columbine Mine	68	28	45.4	1.19	
Conejos	85	40	61.5	2.19	
Cripplecreek	.....	.....	.....	4.17	
Delta	98	37	70.4	0.25	
Durango	92	45	66.8	3.13	
Eagle	86	29	61.3	1.33	
Fort Collins	91	33	67.1	0.71	
Fort Morgan	92	39[h]	70.2[d]	1.56	
Fowler	.....	.....	.....	0.72	
Fruita	97	42	73.4	1.22	
Garnett	84	31	59.6	2.99	
Gilman	.....	.....	.....	2.06	
Gleneyre	88	42	64.9	2.73	
Glenwood	90	31	64.5	0.71	
Greeley	96	36	70.6	0.49	
Grover	.....	.....	.....	2.00	
Gunnison	81	31	59.2	2.87	
Halls Gulch	61	21	45.7	3.94	
Hamps	88	39	65.6	3.09	
Hoehne	96	44	68.8	3.05	
Holly	97	45	74.0	1.85	
Holyoke (near)	96	39	71.8	1.12	
Husted	86	38	63.4	1.94	
Lake Moraine	67	34	49.7	3.12	
Lamar	100	45	75.7	2.20	
Laporte	.....	.....	.....	0.42	
Las Animas	95	41	72.6	.....	
Lay	89	27	64.4	1.89	
Leadville (near)	71	25	52.8	1.71	
Leroy	94	41	70.6	1.17	
Longs Peak	75	24	54.6	6.50	
Mancos	88	41	64.3	4.19	
Marshall Pass	.....	.....	.....	1.22	
Meeker	88	29	62.5	1.56	
Montrose	86[f]	39[f]	65.6[f]	1.06	
Moraine	82	25	56.8	2.30	
Pagoda	88	30	63.2	3.00	
Parachute	94	38	69.6	1.99	
Platte Canon	.....	.....	.....	0.72	
Colorado—Cont'd.					
Rockyford	95	44	72.2	0.33	
Ruby	.....	.....	.....	4.55	
Saguache	83	38	61.6	1.93	
Salida	86	38	62.8	2.50	
San Luis	85	40	60.2	2.65	
Santa Clara	83	40	61.8	3.53	
Sapinero	87	33	59.8	3.25	
Sheridan Lake	95	39	71.3	4.17	
Silt	92	39	66.6	1.90	
Silverton	75	31	54.0	3.17	
Sugar City	.....	.....	.....	0.49	
Sugar Loaf	83	35	62.4	4.82	
Telluride	83[d]	34[d]	57.1[d]	.....	
Trinidad	88	51	68.8	2.61	
Victor	77	37	57.6	4.61	
Vilas	.....	.....	.....	2.77	
Wagon Wheel	76	31	54.4	5.78	
Walden	78	24	56.0	2.79	
Wallet	.....	.....	.....	2.15	
Waterdale	92	33	68.1	1.98	
Westcliffe	80	39	61.0	3.62	
Whitepine	71	28	51.3	4.25	
Wray	96	40	72.1	1.26	
Yuma	.....	.....	.....	1.28	
Connecticut.					
Bridgeport	87	47	69.4	7.72	
Canton	85	39	64.8	6.24	
Colchester	82	43	66.3	5.07	
Falls Village	.....	.....	.....	2.98	
Hartford[b]	84	48	67.2	5.49	
Hawleyville	86	42	67.1	4.00	
Lake Konomoc	.....	.....	.....	5.43	
New London	84	50	68.5	4.03	
North Grosvenor Dale	87	40	66.4	6.61	
Norwalk	92	42	68.0	8.45	
Southington	85	42	66.8	5.45	
South Manchester	.....	.....	.....	4.99	
Storrs	83	46	66.3	6.00	
Voluntown	85	39	67.0	4.31	
Wallingford	.....	.....	.....	5.18	
Waterbury	89	41	69.3	4.93	
West Cornwall	83	46	66.3	3.89	
West Simsbury	.....	.....	.....	5.29	
Delaware.					
Milford	94	50	74.9	0.78	
Millsboro	93	49	73.5	1.77	
Newark	89	48	71.4	5.80	
Seaford	88	49	71.4	1.32	
District of Columbia.					
Distributing Reservoir*[5]	90	59	73.5	1.77	
Receiving Reservoir*[5]	84	57	73.8	2.18	
West Washington	92	52	73.9	3.60	
Florida.					
Apalachicola	93	70	81.3	3.65	
Archer	96	66	78.9	10.76	
Avon Park	94	68	80.9	5.96	
Bartow	94	68	81.2	6.07	
Bonifay	96	65	79.7	5.45	
Brooksville	96	68	79.6	7.84	
Carrabelle	91	67	79.8	9.39	
Clermont	101	70	83.0	7.61	
De Funiak Springs	97	63	78.4	10.78	
Deland	9[illegible]	68	80.2	.....	
Eustis	95	68	81.0	5.84	
Federal Point	94	66	80.0	6.06	
Fernandino	94[e]	69[e]	81.2[e]	.....	
Fort Meade	95	67	80.7	15.17	
Fort Pierce	89	69	80.2	2.98	
Gainesville	95	66	79.9	4.29	
Grasmere	95	65	81.2	.....	
Huntington	96	62	79.5	4.16	
Hypoluxo	90	62	79.6	6.12	
Inverness	93	64	79.0	7.18	
Jasper	93	62	79.0	7.43	
Johnstown	96	62	78.2	8.24	
Kissimmee	93	69	80.8	4.53	
Lake City	96	60	80.7	8.30	
Macclenny	100	63	81.0	5.60	
Malabar	94	68	80.6	2.53	
Manatee	93	69	79.8	10.99	
Marco	94	72	83.3	4.75	
Marianna	97	63	79.9	10.18	
Merritt Island	90	70	81.0	4.05	
Miami	90	69	81.0	9.15	
Micanopy	100[e]	60[e]	80.4[e]	.....	
Middleburg	99	60	79.6	6.06	
Molino	98	63	79.0	10.71	
Monticello	94	61	78.7	9.03	
Myers	90	70	79.6	6.30	
New Smyrna	95	65	79.4	6.70	
Ocala	99	67	80.9	8.72	
Orange City	.....	66	.....	5.33	
Orange Home	96	68	80.8	5.67	
Pinemount	100	64	80.3	7.11	
Plant City	95	67	80.3	7.18	
Rockwell	.....	.....	.....	9.12	
St. Andrews	93	69	80.2	9.03	
St. Augustine	94	64	80.0	4.36	
Florida—Cont'd.					
St. Leo	95	66	79.4	10.45	
Stephensville	95	62	79.4	9.59	
Sumner	93	64	79.2	17.46	
Switzerland	94	63[e]	79.8	5.86	
Tallahassee	91	68[g]	78.9[d]	8.43	
Tarpon Springs	93	66	79.5	13.51	
Titusville	97	64	81.2	4.60	
Wausau	98	62	79.2	9.36	
Wewahitchka	97	66	80.1	10.68	
Georgia.					
Abbeville	.....	.....	.....	6.87	
Adairsville	92	57	76.2	3.26	
Albany	98	67	82.2	14.33	
Allapaha	96	65	79.2	8.28	
Americus	93	62	78.3	7.38	
Athens	91	56	74.8	5.37	
Bainbridge	93	64	78.4	11.42	
Bowersville	98	60	77.0	4.41	
Butler	.....	.....	.....	11.86	
Camak	99	58	78.6	6.73	
Carrollton	94	56	75.8	5.62	
Canton	.....	.....	.....	6.92	
Carlton	.....	.....	.....	5.36	
Clayton	89	57	72.0	10.13	
Columbus	98	63	79.9	8.15	
Covington	96	58	76.7	5.65	
Cordele	97	61	79.2	4.95	
Dahlonega	89	56	72.8	8.76	
Dawson	97	61	80.0	8.61	
Diamond	86	54[f]	71.5[f]	6.62	
Dublin	.....	.....	.....	6.13	
Dudley	97	60	79.0	9.43	
Eastman	100	62	81.0	10.16	
Eatonton	97	59	78.2	5.28	
Elberton	96	56	76.7	6.75	
Experiment	95	58	77.1	6.91	
Fitzgerald	96	62	78.8	5.40	
Fleming	98	62	80.2	9.43	
Forsyth	96	58	78.0	9.91	
Fort Gaines	91	65	78.1	5.87	
Gillsville	93	59	75.8	7.87	
Greenbush	91	55	75.8	6.94	
Greensboro	98	57	78.2	7.94	
Griffin	96	55	77.4	6.44	
Harrison	97	60	78.2	7.24	
Hawkinsville	99	60	79.4	9.23	
Jesup	100	59	80.2	6.36	
Lost Mountain	94	55	75.8	10.84	
Louisville	95	59	77.6	10.12	
Lumpkin	97	60	79.1	7.09	
Mauzy	97	64	79.4	8.44	
Milledgeville	97	59	79.0	6.89	
Millen	99	60	79.6	8.05	
Monticello	99	58	78.3	7.87	
Morgan	94	64	78.5	4.42	
Newnan	97	57	77.0	9.11	
Point Peter	94	56	76.6	6.84	
Poulan	96	63	78.7	10.30	
Putnam	100	60	78.9	7.24	
Quitman	94	65	79.0	8.49	
Ramsey	91	59	75.6	4.65	
Rome	95	56	77.2	6.42	
St. Marys	100	62	81.2	2.34	
Statesboro	99	61	80.2	7.79	
Talbotton	96	59	77.5	7.05	
Tallapoosa	93	55	75.1	6.81	
Thomasville	97	65	79.4	7.95	
Toccoa	89	59	74.0	9.50	
Vidalia	99	62	79.6	9.13	
Valona	96	63	79.8	7.94	
Washington	90	57	76.8	8.94	
Waverly	98	60	80.2	4.05	
Waycross	98	64	80.4	8.07	
Waynesboro	95	59	77.6	9.18	
Westpoint	101	60	79.4	6.61	
Woodbury	93	58	76.6	7.70	
Idaho.					
Albion	91	31	66.6	0.91	
American Falls	97	30	69.6	0.66	
Blue Lakes	103	42	75.2	0.03	
Burnside	95	30	67.8	0.50	
Cambridge	105	34	73.2	0.30	
Chesterfield	92	21	61.5	1.78	
Dewey	90	35	64.8	0.33	
Driggs	92	25	62.9	.....	
Forney	96	23	61.2	0.23	
Garnet	110	51	81.6	T.	
Grangeville	94	38	68.1	0.13	
Hailey	95	35	68.3	0.49	
Idaho City	101	31	68.4	0.48	
Lake	82	28	55.8	0.10	
Lake View	.....	.....	.....	0.25	
Landore	.....	.....	.....	0.47	
Lost River	86	30	65.2	0.07	
Lovell	.....	.....	.....	0.05	
Malad	98[e]	32[e]	70.6[e]	0.57	
Meadows	98	36	65.4	0.32	
Milner	103	34	72.2	0.43	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Temperature. (Fahrenheit.) Minimum.	Temperature. (Fahrenheit.) Mean.	Precipitation. Rain and melted snow.	Precipitation. Total depth of snow.
Idaho—Cont'd.	°	°	°	*Ins.*	*Ins.*
Moscow	98	42	69.4	0.11	
Murray	95	31	62.0	1.53	
Oakley	96	30	67.6	1.00	
Ola	103	41	72.9	0.18	
Orofino	103	39	70.7	0.40	
Payette	107	38	75.2	0.40	
Pollock	102	44	73.1	0.29	
Poplar	......	......	......	0.18	
Porthill	88	36	62.8	0.31	
Priest River	97	33	63.6	0.25	
Riddle	91	29	64.8	0.30	
Roosevelt	82[e]	27[d]	59.6[d]	0.12	
St. Maries	101	36	67.0	0.21	
Soldier	95	30	64.1	0.49	
Swan Valley	92[k]	26[k]	61.2[k]	0.38	
Vernon	95	26	65.6	0.58	
Weston	95	31	67.1	0.70	
Illinois.					
Albion	95	50	73.6	2.23	
Aledo	88	45	68.5	7.58	
Alexander	90	44	71.0	3.84	
Antioch	88	41	66.2	2.20	
Ashton	87	44	66.0	4.51	
Astoria	89	44	68.4	2.77	
Aurora	88	44	66.4	5.62	
Benton	93	52	75.4	2.21	
Bloomington	94	45	72.4	2.95	
Bushnell	92	48	71.2	3.63	
Cambridge	89	52	69.6	5.60	
Carlinville	93	47	72.1	3.57	
Carrollton	91[h]	47[h]	71.0[h]	4.63	
Charleston	92	46	72.8	4.93	
Chester	......	......	......	3.13	
Cisne	94	48	74.1	6.83	
Coatsburg	90	49	70.4	4.65	
Cobden	96	52	75.1	4.73	
Danville	93	45	71.0	5.20	
Decatur	92	46	71.0	5.55	
Dixon	90	43	67.0	3.45	
Equality	98	50	75.8	2.70	
Fandon	89	40	69.8	4.77	
Flora	92	47	71.2	3.02	
Friendgrove	92	53	73.0	4.03	
Galva	89	48	68.2	5.97	
Grafton	......	......	......	4.58	
Greenville	92	52	72.8	5.98	
Griggsville	93	51	72.5	5.41	
Halfway	91	53	74.3	2.80	
Hallidayboro	......	......	......	2.60	
Havana	94	47	72.3	2.50	
Henry	90	44	68.6	4.51	
Hillsboro	93	49	72.8	4.41	
Hoopeston	90	45	70.0	2.81	
Joliet	89	48	68.8	3.19	
Kishwaukee	92	42	68.0	3.35	
Knoxville	89	43	67.4	3.05	
Lagrange	91	46	69.2	3.06	
Laharpe	92	46	69.4	4.20	
Lanark	93	37	67.1	5.03	
Loami	......	......	......	3.65	
McLeansboro	94	50	73.6	2.12	
Martinsville	96[i]	46[i]	71.0[i]	2.25	
Martinton	95	43	69.7	3.24	
Mascoutah	91	50	71.2	7.50	
Mattoon	91	50	74.5	3.95	
Minonk	90	45	68.6	2.69	
Monmouth	92	44	69.4	5.63	
Morrison	88	43	67.0	5.71	
Morrisonville	91	49	71.8	3.19	
Mount Carmel	......	......	......	4.15	
Mount Pulaski	90	48	71.5	4.32	
Mount Vernon	92	52	73.8	3.99	
New Burnside	95	50	75.5	2.33	
Olney	94	51	74.3	1.76	
Ottawa	89	47	68.9	3.58	
Palestine	94	50	73.4	2.78	
Pana	93	51	72.4	4.20	
Paris	91	48	71.9	3.20	
Peoria *a*	......	......	......	3.30	
Peoria *b*	95	48	72.1	4.13	
Philo	92	46	69.8	5.65	
Plumhill	90	48	71.5	4.27	
Pontiac	90	49	69.6	2.45	
Rantoul	93	45	70.4	3.16	
Raum	95	56	75.5	3.35	
Riley	90	44	67.0	3.32	
Robinson	91	49	72.0	4.08	
Rockford	......	......	......	4.06	
Rushville	91	48	70.9	3.25	
St. Charles	88	44	67.0	7.02	
St. John	94	50	74.2	4.16	
Shobonier	......	......	......	5.32	
Streator	90	45	67.6	2.39	
Sullivan	93	46	70.6	4.86	
Sycamore	92	43	67.0	6.49	
Tilden	92	47	72.4	5.33	
Tiskilwa	85	49	67.0	5.37	
Tuscola	91	46	70.4	5.95	
Illinois—Cont'd.					
Urbana	91	46	70.3	3.55	
Walnut	89	47	68.9	4.53	
Winchester	90	49	70.9	4.50	
Windsor	92	46	70.8	4.56	
Winnebago	93	42	67.6	2.95	
Yorkville	90	42	68.6	4.21	
Zion	90	41	67.2	4.29	
Indiana.					
Anderson	89	48	70.2	2.25	
Angola	88	48	67.5	4.39	
Auburn	89	42	67.2	4.92	
Bloomington	91	51	73.7	1.60	
Bluffton	91	42	68.5	2.62	
Butlerville	93	50	72.4	1.78	
Cambridge City	91	44	69.3	0.87	
Columbus	95	45	73.0	1.00	
Connersville	93	47	70.3	1.06	
Crawfordsville	92	47	72.0	4.13	
Delphi	90	44	68.6	2.22	
Elkhart	88	49	68.4	3.26	
Farmersburg	93	49	72.2	3.12	
Farmland	87	48	67.9	3.20	
Fort Wayne	98	42	68.8	1.72	
Franklin	92	47	71.2	1.71	
Greencastle	89	49	71.2	1.99	
Greenfield	91	49	71.5	1.10	
Greensburg	93	47	72.2	1.95	
Hammond	90	49	69.2	2.62	
Hector	97	47	71.4	2.68	
Holland	94	51	74.7	2.37	
Huntington	89	45	68.0	2.88	
Jeffersonville	95	52	76.2	2.03	
Lafayette	90	47	70.2	2.40	
Laporte	83	46	67.8	3.04	
Logansport	91	46	69.2	1.50	
Madison *a*	97	50	75.5	1.08	
Madison *b*	......	......	......	1.76	
Marengo	95	47	73.4	1.87	
Marion	91	45	68.7	2.90	
Markle	90	43	67.9	2.20	
Mauzy	......	......	......	1.88	
Moores Hill	93	50	73.4	2.16	
Mount Vernon	96	58	77.4	1.36	
Northfield	90	42	68.0	2.17	
Paoli	95	45	73.7	2.01	
Princeton	93	49	74.0	4.90	
Rensselaer	87	44	68.2	2.97	
Richmond	92	43	69.8	1.09	
Rochester	91	45[j]	69.2[f]	4.59	
Rockville	92	50	71.0	3.16	
Rome	101	48	76.4	1.21	
Salem	97	48	74.1	1.25	
Scottsburg	94	50	74.9	1.12	
Seymour	92	49	72.8	1.40	
South Bend	90	45	67.8	3.00	
Syracuse	90	42	68.7	6.79	
Terre Haute	93	51	74.7	2.32	
Topeka	88	42	66.8	4.00	
Valparaiso	91	46	69.8	2.80	
Veedersburg	93[e]	44[e]	70.8[e]	3.03	
Vevay	94	53	74.5	2.15	
Vincennes	96	50	74.6	4.11	
Washington	90	51	72.2	2.68	
Winamac	91[c]	43[d]	69.0[d]	2.64	
Worthington	93	50	73.0	2.50	
Indian Territory.					
Ardmore	104	64	82.3	2.00	
Chickasha	101	58	79.3	3.76	
Claremore	98	56	77.6	2.17	
Durant	103	60	80.4	1.43	
Fairland	94	52	76.2	3.65	
Goodwater	103	55	81.3	0.50	
Hartshorne	......	......	......	4.37	
Healdton	101	60	79.2	6.14	
Holdenville	98	61	80.0	3.97	
Marlow	103	61	80.0	2.06	
Muskogee	97	58	78.2	2.30	
Pauls Valley	104	58	79.8	1.23	
Ravia	102	62	81.0	1.39	
Roff	101	......	......	1.33	
South McAlester	101	62	81.4	1.76	
Tahlequah	......	......	......	2.55	
Tulsa	......	......	......	3.79	
Vinita	95	52	76.8	2.29	
Wagoner	102	56	79.3	0.91	
Webbers Falls	98	54	77.7	2.53	
Iowa.					
Afton	92	45	71.0	4.66	
Albia	92	46	69.9	3.73	
Algona	89	45	67.5	2.95	
Allerton	95	47	71.2	3.90	
Alta	89	44	67.6	4.92	
Amana	91	43	68.8	2.88	
Ames	92	40	69.0	3.37	
Atlantic	94	39	69.8	3.80	
Audubon	91	36	69.8	3.11	
Baxter	91	44	68.5	2.23	
Bedford	94	43	70.2	6.39	
Iowa—Cont'd.					
Belknap	91	50	71.8	4.25	
Belleplaine	90	47	68.4	2.68	
Bonaparte	92	45	69.4	4.40	
Britt	90	41	66.6	2.39	
Buckingham	......	......	......	2.30	
Burlington	91	50	71.0	6.08	
Carroll	90	41	68.8	3.16	
Cedar Rapids	94	47	70.1	2.54	
Chariton	91	45	69.6	3.32	
Charles City	90	39	65.4	2.42	
Clarinda	95	44	71.2	4.17	
Clearlake	89	47	68.4	2.00	
Clinton	95	42	68.0	5.36	
College Springs	94	48	73.3	4.19	
Columbus Junction	90	47	69.1	5.72	
Corning	90	42	69.4	3.35	
Corydon	93	45	71.4	2.82	
Cresco	90	39	66.2	2.66	
Cumberland	......	......	......	3.25	
Decorah	89	39	66.7	2.06	
Delaware	90	44	66.9	2.50	
Denison	92	42[c]	69.7	2.95	
Desoto	90	44	70.0	3.08	
Dows	89	40	66.4	2.57	
Earlham	89	35	67.2	2.84	
Elkader	94	40	68.5	2.06	
Estherville	94	44	66.6	3.96	
Fayette	91	36	66.2	3.81	
Florence	......	......	......	2.29	
Forest City	89	43	66.0	2.97	
Fort Dodge	91	42	67.9	6.75	
Fort Madison	......	......	......	5.32	
Galva	90	39	67.8	2.56	
Gilman	......	......	......	2.92	
Glenwood	90	49	70.4	3.22	
Grand Meadow	86	40	66.2	2.95	
Greene	91	40	67.8	2.59	
Greenfield	89	45	69.6	3.94	
Grinnell	91	47	69.1	2.56	
Grundy Center	91	41	67.8	2.61	
Guthrie Center	91	41	70.0	4.12	
Hampton	92	44	69.4	2.50	
Hanlontown	88	41	65.4	2.33	
Harlan	91	41	69.0	1.91	
Hopeville	95	47	71.0	4.97	
Humboldt	89	45	68.2	3.66	
Ida Grove	93	43	69.6	2.28	
Independence	92	41	67.6	1.80	
Indianola	91	45	70.2	3.99	
Inwood	92	45	68.3	1.99	
Iowa City	94	46	69.4	3.93	
Iowa Falls	90	39	65.8	2.14	
Jefferson	......	......	......	4.07	
Keosauqua	94	46	70.2	3.85	
Knoxville	92	45	72.0	4.85	
Lacona	......	......	......	3.61	
Larrabee	92	45	69.0	3.38	
Leclaire	......	......	......	4.29	
Lemars	93[e]	41[e]	69.2[e]	1.92	
Lenox	90	47	69.9	5.16	
Leon	91	47	71.2	4.45	
Little Sioux	......	......	......	1.78	
Logan	95	43	71.2	0.99	
Maple Valley	......	......	......	4.96	
Maquoketa	93	38	66.8	4.47	
Marshalltown	95	40	69.0	3.24	
Mason City	89	48	68.2	2.10	
Massena	95	40	71.2	4.03	
Montezuma	......	......	......	3.60	
Monticello	......	......	......	3.08	
Mountayr	97	48	72.8	5.87	
Mount Pleasant	92	47	70.6	5.21	
Mount Vernon	93	45	70.1	4.07	
New Hampton	88	43	65.0	1.84	
Northwood	87	43	65.6	2.65	
Odebolt	95	42	70.0	3.36	
Ogden	91	46	68.8	2.51	
Olin	91	42	68.0	3.54	
Onawa	96	49	72.8	2.63	
Osage	90	42	[illegible].6[h]	1.91	
Osceola	95	44	71.1	5.67	
Oskaloosa	90	45	69.8	2.36	
Ottumwa	95	50	72.9	2.72	
Pacific Junction	93	45	70.6	3.24	
Perry	91	44	70.0	4.21	
Plover	90	41	67.7	4.47	
Pocahontas	90	44	69.0	4.53	
Primghar	89	43	67.6	2.88	
Redoak	88	50	72.1	2.03	
Ridgeway	94	50	69.7	2.25	
Rock Rapids	90	40	67.6	2.40	
Rockwell City	91	45	68.2	5.95	
Sac City	91	44	69.3	5.48	
St. Charles	90	49	70.8	4.33	
Sibley	91	38	65.0	0.66	
Sioux Center	91	42	67.8	1.47	
Spirit Lake	89	44	67.9	3.08	
Stockport	89	50	70.6	3.67	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Iowa—Cont'd.	°	°	°	*Ins.*	*Ins.*
Storm Lake	88	44	66.4	5.16	
Stuart	90	48	71.0	3.48	
Thurman	93	44	71.3	3.38	
Tipton	94	51	71.0	3.06	
Toledo	92	40	68.6	3.00	
Vinton	92	40	68.6	2.41	
Wapello	88	49	70.1	6.49	
Washington	92	48	69.6	4.39	
Washta				1.42	
Waterloo	93	43	68.4	2.93	
Waukee	97	45	72.0	3.25	
Waverly	90	41	67.3	2.42	
Westbend	88	42	66.9	3.18	
Whitten	90	42	68.0	3.24	
Wilton Junction	93	43	69.4	5.15	
Winterset	95	46	71.2	2.30	
Woodburn				4.33	
Zearing	91	42	68.3	3.48	
Kansas.					
Achilles	98	39	71.6	2.50	
Alton	98	45	74.2	4.06	
Anthony				2.77	
Atchison	92	50	72.2	3.90	
Baker	96	48	73.5	2.76	
Burlington	100	46	75.6	3.13	
Chapman	95	47	74.0	1.06	
Clay Center	99	45	73.8	2.54	
Coffeyville	99	56	79.3	2.23	
Colby	100	39	73.0	3.00	
Columbus	95	53	75.0	5.61	
Cunningham	97	51	75.8	2.97	
Dresden	99	46	72.6	5.75	
Eldorado	95	48	74.2	3.58	
Ellinwood	96	48	75.1	3.04	
Ellsworth				4.34	
Emporia	96	48	73.9	3.73	
Englewood	99	56	80.7	3.06	
Enterprise	95	47	73.8	1.74	
Eureka				3.18	
Fall River	97	50	75.2	3.55	
Farnsworth	100	42	74.2	1.84	
Forsha	95	50	75.0	2.76	
Fort Leavenworth	97	51	74.9	5.19	
Fort Scott	100	50	75.1	4.63	
Frankfort	99	42	73.8	2.61	
Garden City	100	47	76.4	1.32	
Gove*[1]	95	50	72.6	2.57	
Grenola	96	48	73.8	2.98	
Hanover	101[b]	38[i]	71.8[i]	1.08	
Harrison	99	40	72.5	1.83	
Holton	100[e]	46	73.5[e]	3.28	
Horton	96	51	73.2	2.41	
Hoxie	99	42	74.2	3.37	
Hugoton	101	50	75.2	3.08	
Hutchinson	97	45	73.1	3.15	
Independence	102	55	78.0	5.17	
La Crosse	100	46	74.8	3.88	
Lakin	98	46	75.0	1.54	
Larned	97	46	73.4	3.55	
Lebanon	94[d]	45[d]	71.7[d]	3.50	
Lebo	98	49	75.0	2.10	
Macksville	95	50	73.8	3.87	
McPherson	101	47	76.1	2.81	
Madison				1.72	
Manhattan *b*	96	47	74.4	1.89	
Manhattan *c*	100	45	74.8	2.46	
Marion	96[d]	50[d]	76.0[d]	2.70	
Medicine Lodge	103	54	79.0	3.51	
Minneapolis	97	47	74.4	3.19	
Moran	98	52	75.0	5.13	
Mounthope	94	52	75.2	2.18	
Ness City	104	48	77.7	1.59	
Newton	99	49	76.4	1.36	
Norton	101	39	72.2	2.61	
Norwich	97	53	76.4	3.05	
Oberlin				5.85	
Olathe	96	51	74.0	6.25	
Osage City	98	47	74.4	3.30	
Osborne				3.17	
Oswego	95	55	75.4	5.09	
Ottawa	99	44	73.6	2.39	
Paola	97[e]	49[e]	74.3[d]	3.00	
Phillipsburg	99	46	72.8	6.25	
Pleasanton	98	50	74.6	7.07	
Pratt	98	52	75.4	3.27	
Republic	99	42	72.8	1.45	
Rome	100	52	76.8	3.45	
Russell	100	46	73.7	3.13	
Salina	99	46	75.5	3.04	
Sedan	96	55	75.8	9.27	
Toronto	99	46	73.8	3.62	
Ulysses		44[e]		2.67	
Valley Falls	96	46	72.2	3.90	
Viroqua	100	48	74.8	1.86	
Wakeeney	97	49	73.4	3.36	
Wakeeney (near)				4.17	
Wallace	96	43	73.1	3.65	
Walnut	95	53[f]	74.6[e]	5.46	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Kansas—Cont'd.	°	°	°	*Ins.*	*Ins.*
Wamego*[1]	94	51	73.8	2.55	
Winfield	95	51	74.6	5.70	
Yates Center	95	50	74.3	3.09	
Kentucky.					
Alpha	90	50	75.7	1.85	
Anchorage	96	52	75.2	1.14	
Bardstown	98	54	77.7	3.77	
Beattyville	94	49	75.0	3.50	
Beaver Dam	99	45	76.6	0.61	
Berea	98[h]	51	75.0[e]	5.01	
Blandville	93	54	75.4	2.17	
Bowling Green	98	49	76.6	2.41	
Burnside	95	58	76.2	5.41	
Cadiz	100	54	78.1	2.94	
Calhoun	97	55	77.6	1.81	
Catlettsburg	91	53	74.4	2.78	
Earlington	95	48	75.5	1.51	
Edmonton	93	52	75.6	2.92	
Eubank	90	53	73.1	3.36	
Falmouth				2.20	
Fords Ferry	95	51	75.0	2.83	
Frankfort	91	56	74.4	4.12	
Greensburg	97	48	75.9	5.48	
Highbridge	95	51	75.7	1.92	
Hopkinsville	97	50	76.7	1.26	
Irvington	94	54	76.1	2.10	
Jackson	93	52	75.4	3.93	
Leitchfield	94	52	75.0	1.28	
Loretto	94	51	75.2	2.63	
Maysville	94	49	74.4	3.23	
Middlesboro	90[g]	52[g]	73.6[g]	4.10	
Mount Sterling	90	54	74.0	5.52	
Owensboro	93	54	75.2	1.75	
Owenton	94[g]	53[g]	75.2[g]	1.92	
Paducah *a*				0.92	
Paducah *b*	98	57	78.1	1.00	
Princeton	95	55	76.0	2.46	
Richmond	92	52	75.6	3.29	
St. John	93	50	73.9	1.12	
Scott	96	49	75.0	0.59	
Shelby City	92	49	74.2	3.50	
Shelbyville	96	50	75.5	3.53	
Taylorsville	94	50	74.6	1.23	
Williamsburg	91	54	75.0	4.66	
Williamstown	93	53	73.7	2.54	
Louisiana.					
Abbeville	96	68	80.4	7.37	
Alexandria	96	65	80.0	3.65	
Amite	97	65	80.2	5.44	
Baton Rouge	97	69	81.3	7.47	
Burnside	94	67	79.8	3.54	
Calhoun	97	58	79.4	2.36	
Cameron	91	68	80.8	3.91	
Caspiana	100	57	81.0	1.66	
Cheneyville	98	64	80.5	3.25	
Clinton	91	67	78.2	6.51	
Collinston	98	61	80.4	2.97	
Covington	98	67	81.4	7.14	
Donaldsonville	97	67	80.8	5.78	
Emilie	93	63	79.2	5.30	
Farmerville	94[e]	61[e]	80.6[e]	3.52	
Franklin	98	68	81.2	6.01	
Grand Coteau	95	68	80.1	8.23	
Hammond	95	67	79.4	8.88	
Houma	94	66	79.6	5.18	
Jennings	94	68	80.2	4.41	
Lafayette	94	67	79.7	7.44	
Lake Charles	97	69	80.6	5.60	
Lakeside	95	67	80.6	4.46	
Lawrence	95[g]	68[g]	80.7[g]	8.39	
Leesville	96	62	79.5	6.58	
Libertyhill	102	60	80.8	2.10	
Logansport				5.20	
Melville	95	65	79.8	5.75	
Minden	101	57	78.7	3.83	
Monroe	94	63	79.1	4.89	
New Iberia	92	70	80.0	3.90	
Opelousas	97	67	80.4	6.30	
Oxford	100[e]	57[e]	80.2[e]	1.92	
Plain Dealing	100	53	79.9	1.81	
Port Eads	91	70	81.4	13.31	
Rayne	96	67	80.4	10.25	
Reserve	98	65	81.3	5.84	
Robeline	99	58	79.2	2.27	
Ruston	99	59	80.3	3.30	
Schriever	98	65	80.4	3.29	
Southern University				6.84	
Sugar Experiment Station	93	67	80.8	5.74	
Sugartown	95	67	80.4	2.23	
Venice	92	67	78.8	7.59	
Maine.					
Bar Harbor	88	39	63.0	5.24	
Belfast	86	39	62.3	4.66	
Chesuncook				5.44	
Cornish	90	43	65.0	5.12	
Danforth				3.02	
Fairfield	88	42	65.0	4.39	
Farmington	86	39	63.2	4.58	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Maine—Cont'd.	°	°	°	*Ins.*	*Ins.*
Gardiner	92	40	65.7	4.53	
Grant Farm				2.55	
Houlton	83	40	62.5	3.00	
Lewiston	92	45	66.2	4.29	
Madison	85	42	63.4	7.38	
Mayfield	80	42	62.0	5.32	
Millinocket	85	40	63.1	4.06	
North Bridgton	89	44	66.3	5.91	
Oquossoc	87	32	61.8	4.77	
Orono	88	40	64.2	4.46	
Patten	84	32	60.8	2.49	
Rumford Falls	86	42	64.4	4.10	
South Lagrange	86	35	63.0	5.10	
The Forks				2.69	
Thomaston	85	35	62.6	4.31	
Vanburen	85	32	61.5	2.16	
Vanceboro	86	30	63.0	2.14	
Winslow	90	39	65.0	4.94	
Maryland.					
Annapolis	92	56	75.6	7.40	
Bachmans Valley	86	44	69.4	7.04	
Boettcherville	97	39	72.3	3.93	
Cambridge	95	52	76.2	0.73	
Chase	89	44	70.4	1.84	
Cheltenham	93	52	72.3	1.34	
Chestertown	87	51	72.0	2.37	
Chewsville	88	42	70.0	3.32	
Clearspring	90	47	70.0	3.25	
Coleman	92	52	74.0	2.77	
Collegepark	96	48	73.3	3.02	
Colora				4.01	
Cumberland				2.34	
Darlington	86	48	70.5	8.74	
Deerpark	86[f]	31[f]	59.8[f]	1.95	
Denton	91	47	73.4		
Easton	89	51	72.8	1.00	
Fallston	89	49	70.7	5.38	
Frederick	91	46	72.2	3.44	
Grantsville	92	35	65.0	1.97	
Greatfalls	94	47	73.0	1.62	
Greenspring Furnace	93	42	71.4	2.80	
Hancock	97	41	72.6	0.95	
Harney				4.08	
Jewell	88	53	72.6	0.69	
Johns Hopkins Hospital	89	55	73.8	2.34	
Laurel	95	50	73.6	1.40	
Mount St. Marys College		49		3.12	
New Market	90	47	70.6	2.44	
Oakland	85	31	64.6	1.52	
Pocomoke City	90	53	74.8	2.83	
Princess Anne	87	47	72.2	1.90	
Solomons	90	60	75.4	2.61	
Sudlersville	95[e]	48[e]	74.6[e]	3.70	
Takoma Park	92	51	72.0	4.07	
Van Bibber		50	70.8[e]	4.39	
Westernport	91	40	69.8	2.20	
Woodstock	90	48	71.9	3.17	
Massachusetts.					
Amherst	90	40	67.0	4.09	
Bedford	86	46	65.5	3.27	
Bluehill (summit)	85	50	66.6	2.21	
Cambridge	90	44	68.4	2.37	
Chestnuthill	92	44	68.4	2.74	
Concord	89	40	65.3	3.13	
East Templeton*[1]	88	50	65.2	3.71	
Fall River	81	50	67.0	4.26	
Fitchburg *a**[1]	87	52	65.8	3.79	
Fitchburg *b*	90	47	66.9	3.85	
Framingham	90	44	65.4	3.41	
Groton	89	41	65.6	3.53	
Hyannis				4.19	
Jefferson				3.54	
Lawrence	87	45	66.5	2.88	
Leominster				4.11	
Lowell *a*	90	46	69.3	3.21	
Lowell *b*	90	44	68.4		
Ludlow Center	84	37	62.8	5.15	
Middleboro	83	38	66.2	3.14	
Monson	85	40	65.0	4.72	
New Bedford	81	48	66.2	5.15	
Plymouth*[1]	82	54	67.1	3.52	
Princeton				3.91	
Provincetown	84	52	68.4	2.23	
Salem				3.05	
Somerset*[1]	88	44	69.4	3.82	
Sterling				3.59	
Taunton	82	39	66.8	4.95	
Webster				4.93	
Westboro	90	41	67.6	4.40	
Weston	88	41	65.4	3.84	
Williamstown	85	35	62.2	4.34	
Winchendon				7.08	
Worcester	88	50	67.8	3.80	
Michigan.					
Adrian	89	42	67.0	3.25	
Agricultural College	86	43	65.9	3.26	
Allegan	86[d]	40[d]	67.0[d]	3.91	
Alma	87	39	64.9	2.44	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
***Michigan*—Cont'd.**					
Ann Arbor	88	46	67.3	4.55	
Arbela	91	41	67.2	2.40	
Baldwin	85	40	62.8	2.00	
Ball Mountain	87	45	65.2	4.43	
Baraga	......	......	......	2.01	
Battlecreek	86	44	65.5	1.87	
Bay City	88	40	65.5	2.60	
Benzonia	86[h]	41[i]	62.5[i]	1.75	
Berlin	88	42	65.5	3.74	
Berrien Springs	88[d]	41[c]	66.7[d]	3.50	
Big Rapids	85	32	62.0	1.53	
Birmingham	90	42	66.0	3.76	
Bloomingdale	89	41	66.8	3.26	
Calumet	80	46	60.8	2.82	
Cassopolis	88	44	68.6	4.20	
Charlevoix	86	48	63.3	1.56	
Chatham	84	34	57.4	3.07	
Cheboygan	87	36	62.7	3.00	
Clinton	87	40	66.9	4.89	
Coldwater	87	44	67.2	4.05	
Deer Park	85	40	58.4	2.79	
Detour	79	42	60.4	2.67	
Dundee	88	41	67.1	4.73	
Eagle Harbor	84	45	60.6	3.35	
East Tawas	83	40	61.8	1.66	
Eloise	87	44	67.2	3.69	
Ewen	87	30	59.2	......	
Fennville	84	43	64.6	3.39	
Fitchburg	86	39	64.7	4.11	
Flint	87	40	65.0	2.35	
Gaylord	82[d]	31	60.0	......	
Gladwin	86[f]	34[f]	62.7[f]	1.10[f]	
Grand Haven	80	42	63.8	2.68	
Grand Marais	85	43	59.2	1.95	
Grape	88[d]	42[d]	66.0[d]	4.31	
Grayling	85	30	61.2	3.05	
Hagar	87	41	65.0	4.73	
Harbor Beach	85	45	65.2	1.37	
Harrison	84	40	63.2	1.20	
Harrisville	88	41	63.0	1.75	
Hastings	85	38	64.8	4.01	
Hayes	87[g]	36[g]	65.3[g]	2.20	
Highland	......	......	......	2.83	
Hillsdale	86	43	66.1	5.10	
Howell	87	42	65.9	2.12	
Humboldt	85[f]	29[g]	59.1[g]	......	
Ionia[d]	85	39	63.1	......	
Iron Mountain	84	37	61.2	3.10	
Iron River	83	30	58.3	5.55	
Ironwood	82	41	62.1	3.35	
Ishpeming	79	36	58.2	4.27	
Ivan	85	35	61.8	2.36	
Jackson	88	45	67.8	3.94	
Jeddo	89	44	66.0	2.68	
Kalamazoo	88[c]	44[c]	67.0[c]	3.35	
Lake City	85	37	60.8	......	
Lansing	87	43	66.6	2.76	
Lapeer	90	44	67.4	1.05	
Mackinac Island[f]	76	41	59.6	3.98	
Mackinaw City	89[c]	30	60.8	4.30	
Mancelona	84	28	60.4	1.14	
Manistee[g]	80	46	63.9	......	
Marine City	83	43	65.4	3.57	
Menominee	85	43	63.5	2.57	
Midland	86	42	66.4	......	
Montague	85	43	65.3	1.59	
Mount Clemens	90	40	65.0	......	
Muskegon	82	46	65.3	2.50	
Newberry[f]	82	30	60.4	......	
Old Mission	85	45	63.9	1.99	
Olivet	83	46	67.0	4.66	
Omer	84	25	59.0	2.40	
Onaway	86	33	62.1	......	
Ovid	87	35	64.2	2.14	
Petoskey	88	40	62.9	7.95	
Plymouth	90	34	63.2	......	
Port Austin	90[c]	35[f]	63.0[f]	......	
Powers	86	33	59.7	......	
Reed City	86	32	60.5	1.20	
Roscommon	85	28	59.8	1.80	
Saginaw (W. S.)	89	41	66.4	2.06	
St. Ignace	81	42	62.2	3.05	
Slocum	84	41	63.4	1.98	
South Haven	84[f]	42	64.0[c]	5.18	
Stanton	87	38	63.4	2.81	
Thomaston	85	30	59.8	5.80	
Thornville	87	43	65.5	3.86	
Traverse City	87	43	63.1	3.66	
Vassar	88	......	......	1.55	
Wasepi	84	43	65.5	4.55	
Webberville	88	41	65.3	3.93	
West Branch	85[c]	35	61.5[g]	......	
Wetmore	79	25	57.6	3.70	
Whitefish Point	82	41	57.6	2.47	
Ypsilanti	86	41	64.6	3.92	
Minnesota.					
Albert Lea	88	41	67.1	2.45	
Angus	87	36	61.6	2.88	
***Minnesota*—Cont'd.**					
Beardsley	98	39	66.2	3.77	
Bemidji	89	43	65.8	1.56	
Bird Island	92	43	67.0	3.00	
Brainerd	88	44	63.7	1.27	
Caledonia	88	37	65.0	2.09	
Collegeville	89	47	66.0	4.14	
Crookston	86	40	62.1	1.94	
Currie	90	39	66.4	......	
Deephaven	......	......	......	4.70	
Detroit City	88	39	62.4	1.31	
Faribault	88	42	64.5	2.52	
Farmington	87	45	65.7	4.39	
Fergus Falls	88	41	65.2	1.39	
Grand Meadow	88	43	65.4	1.99	
Hallock	85	37	60.9	1.63	
Lake Winnibigoshish	84	40	62.2	2.91	
Leech	88	38	62.4	2.34	
Long Prairie	91	41	64.4	1.84	
Luverne	90	41	66.0	1.42	
Lynd	89	42	65.6	2.63	
Mapleplain	90	44	65.0	5.58	
Milaca	89	34	62.4	4.42	
Milan	91	42	65.4	2.57	
Minneapolis[1]	91*	43	65.8	5.67	
Montevideo	94	43	67.4	1.75	
Mora	90	35	62.0	3.58	
Morris	87	42	64.0	3.92	
Mount Iron	85	31	60.5	2.47	
New London	92	46	67.2	3.39	
New Richland	90	43	67.7	2.00	
New Ulm	93	45	67.4	1.89	
Pine River	95	40	65.0	1.76	
Pipestone	87	41	64.6	3.42	
Pleasant Mounds	88[h]	40[h]	65.0[h]	1.90	
Pokegama Falls	89	27	60.0	1.39	
Redwing *a*	......	......	......	3.52	
Reeds	......	......	......	2.10	
Rolling Green	86	43	66.6	2.75	
St. Charles	88	42	66.4	2.14	
St. Cloud	88	43	66.3	6.00	
St. Peter	91	42	67.2	3.15	
Sandy Lake Dam	92	40	62.8	1.49	
Shakopee	88	45	66.2	4.92	
Wabasha	95	39	68.0	2.63	
Wadena	94	40	63.4	1.49	
Willow River	89	37	62.5	3.30	
Winnebago	91	44	67.6	2.02	
Winona	91	42	66.9	1.91	
Worthington	92	41	66.2	0.97	
Zumbrota	87[i]	41[b]	64.8[i]	......	
Mississippi.					
Aberdeen	99	60	80.0	2.29	
Austin	97	56	78.7	3.81	
Batesville	95	57	78.3	2.70	
Bay St. Louis	94	68	80.4	7.93	
Biloxi	97[c]	70[c]	81.5[c]	9.25	
Booneville	96	58	78.7	1.38	
Brookhaven	99	63	80.4	2.20	
Canton	97	63	79.6	1.41	
Columbia	97	63	79.1	3.46	
Columbus	100	60	79.8	1.62	
Corinth	92	57	77.4	1.86	
Crystal Springs[j]	96	64	78.8	......	
Duck Hill	96	60	78.5	1.69	
Edwards	95	62	78.8	4.44	
Fayette	95	64	78.2	3.55	
Fayette (near)	......	......	......	5.44	
Greenville *a*	96	61	79.9	1.64	
Greenville *b*	98	62	80.8	1.72	
Greenwood	97	60	78.8	4.83	
Hazlehurst	96	64	79.3	4.87	
Hernando	100	56	79.9	1.59	
Holly Springs	95	58	79.0	4.44	
Indianola	96	60	79.2	0.65	
Jackson	94	66	79.5	4.75	
Kosciusko	99	61	79.5	2.71	
Lake	96	60	78.7	6.66	
Lake Como	98	62	79.8	6.16	
Laurel	102	65	81.7	4.87	
Leakesville	100	66	80.8	4.98	
Louisville	94	62	78.3	5.37	
Macon	98	61	80.2	1.80	
Magee	96	62	78.6	6.17	
Magnolia	98	66	80.4	5.06	
Natchez	98	61	80.8	3.95	
Nitta Yuma	96	60	79.6	1.84	
Okolona	99	61	81.1	3.84	
Patmos	......	......	......	2.84	
Pearlington	98	65	80.6	4.34	
Pittsboro	97	61	79.1	3.40	
Pontotoc	95	58	77.0	3.38	
Poplarville	94	67	78.2	7.54	
Port Gibson	97	63	80.1	3.86	
Ripley	94	60	78.6	3.10	
Shelby	......	......	......	2.19	
Shoccoe	97	61	78.2	2.48	
Stonington	......	......	......	4.83	
Suffolk	97	63	79.0	3.04	
***Mississippi*—Cont'd.**					
Swartwout	96	67	79.6	14.18	
Tupelo	96	59	78.8	3.24	
University	97	57	79.0	4.74	
Utica	95	63	79.3	3.52	
Walnutgrove	93[c]	62[c]	77.8[c]	3.86	
Watervalley	98	59	79.6	3.53	
Waynesboro	98	63	80.8	6.33	
Woodville	95	67	80.0	6.09	
Yazoo City	96	61	79.5	2.70	
Missouri.					
Appleton City	98	52	74.8	6.65	
Arthur	95	50	73.6	9.29	
Avalon	95	49	72.3	5.91	
Bethany	91	45	70.2	4.93	
Birchtree	92[c]	54[f]	74.1[f]	8.39	
Blue Springs	95	48	71.8	5.23	
Boonville	......	......	......	6.98	
Brunswick	96	52	72.2	5.72	
Caruthersville	97	55	77.9	3.30	
Conception	94	52	72.9	4.91	
Darksville	93	52	73.1	4.90	
Dean	94	52	75.6	5.63	
Desoto	97	50	73.4	6.67	
Doniphan	96	50	76.2	1.98	
Downing	......	......	......	3.70	
Fairport	......	......	......	7.29	
Fayette	94	48	71.2	4.31	
Fulton	95	47	73.2	6.39	
Gallatin *[1]	98	56	75.0	6.25	
Gano	95	48	74.0	5.94	
Glasgow	94	52	73.2	4.24	
Gorin	......	......	......	3.37	
Grant City	94	47	72.2	4.47	
Halfway	96	51	74.0	6.15	
Harrisonville	99	51	73.8	3.15	
Hazlehurst	......	......	......	4.75	
Hermann	......	......	......	4.89	
Houston	94	47	72.8	3.70	
Huntsville	95[d]	49[d]	73.2[d]	4.39	
Ironton	94	44	73.4	5.40	
Jackson	96	49	74.8	4.84	
Jefferson City	95	50	73.8	4.72	
Joplin	92	55	76.2	6.41	
Kidder	93	49	71.7	6.77	
Koshkonong	93	51	75.0	2.78	
Lamar	95	53	75.1	6.66	
Lamonte	......	......	......	6.59	
Lebanon	93	51	75.0	5.48	
Lexington	96	50	73.8	4.88	
Liberty	93	53	72.9	6.83	
Lockwood	......	......	......	5.73	
Louisiana	94	45	71.0	6.23	
Macon	96	51	73.5	3.84	
Marblehill	93	50	74.8	5.88	
Maryville	95	50	72.0	9.51	
Mexico	98	47	74.0	3.42	
Miami *[5]	94	56	74.1	5.83	
Monroe City	94	43	71.0	6.64	
Montreal	94	45	72.6	4.82	
Mountaingrove	89	50	72.9	8.33	
Mount Vernon	94	48	73.8	6.20	
Neosho	91	48	74.2	6.74	
Nevada	......	......	......	5.59	
New Haven	96	55	75.0	5.87	
New Madrid	......	......	......	4.13	
New Palestine	97	52	74.8	8.64	
Oakfield	95	53	74.1	6.62	
Olden	93	48	74.3	4.90	
Oregon	94	51	72.6	5.74	
Palmyra *[5]	92	56	75.0	6.60	
Pine Hill	......	......	......	4.27	
Princeton	99	49	74.8	8.82	
Protem	95[c]	56[i]	76.1[g]	2.73	
Rockport	......	......	......	6.38	
Rolla	......	......	......	6.06	
St. Charles	96	52	73.9	6.34	
St. Joseph	......	......	......	3.92	
Sarcoxie	......	......	......	7.60	
Sedalia	97	51	73.8	6.30	
Seymour	94	46	72.1	5.16	
Sikeston	93	51	75.2	3.03	
Steffenville	91	49	72.4	3.90	
Sublett	91	46	72.2	3.56	
Trenton	92	52	72.3	5.85	
Unionville	94	46	71.9	4.57	
Versailles	95	50	74.5	4.46	
Warrensburg	100	51	75.0	4.99	
Warrenton	95	51	73.2	6.56	
Warsaw	95	45	72.6	5.11	
Wheatland	......	......	......	6.90	
Willowsprings	95	47	73.4	4.32	
Windsor	97	50	74.2	4.39	
Zeitonia	94	49	74.6	6.01	
Montana.					
Adel	92	25	58.6	0.26	
Anaconda	92	34	65.0	0.50	
Augusta	91	31	60.8	0.32	
Boulder	90	33	62.8	0.70	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Montana—Cont'd.	°	°	°	*Ins.*	*Ins.*
Bozeman	89	34	63.6	0.86	
Butte	88	37	64.2	0.35	
Canyon Ferry	96	35	66.2	0.73	
Cascade	100	35	67.4	0.12	
Chester	94	32	65.0	0.03	
Chinook	98[c]	37[c]	67.4[c]	0.83	
Columbia Falls	93	32	63.0	1.82	
Crow Agency	98	38	68.6	0.50	
Culbertson	97	36	64.6	0.64	
Dayton	94	38	69.7	1.70	
Deerlodge	88	31	61.2	......	
Dillon	90	26	60.7	1.18	
Forsyth	98	34	67.8	0.28	
Fort Benton	94	38	65.8	0.83	
Fort Harrison	97	36	69.2	......	
Glasgow	97	34	64.2	0.42	
Glendive	97	40	66.8	0.75	
Grayling	86	17	53.6	1.18	
Greatfalls	96	41	67.7	0.57	
Hamilton	93	37	66.0	0.24	
Hayden	99	33	64.3	1.30	
Lame Deer	99	34	69.2	T.	
Lewistown	95	29	63.4	0.60	
Lodge Grass	97[d]	33[d]	66.9[d]	0.32	
Marysville	90	37	63.8	0.53	
Missoula	97	36	70.4	0.21	
Ovando	93	25	60.8	0.62	
Parrot	96	37	67.3	0.43	
Philipsburg	95	31	62.1	0.25	
Plains	95	40	67.2	1.03	
Poplar	98	34	65.8	0.70	
Redlodge	88	31	62.0	1.18	
Ridgelawn	100	40	67.4	0.40	
St. Pauls	96	45	70.4	1.78	
St. Peter	90	35	65.2	0.06	
Springbrook	111	37	66.8	0.98	
Toston	93	32	64.6	0.33	
Troy	95	33	63.0	0.39	
Twin Bridges	100	28	64.8	0.10	
Utica	93	32	64.7	0.42	
Wibaux	96	36	63.7	1.49	
Wolf Creek	95	32	63.8	0.34	
Yale	97	30	64.8	0.37	
Nebraska.					
Agate	93	39	67.6	1.06	
Albion	91	41	68.8	3.02	
Alliance	98	45	73.0	1.80	
Alma	96	42	72.0	5.34	
Ansley	95	......	......	4.33	
Arapahoe	......	......	......	3.02	
Arcadia	......	......	......	2.18	
Ashland *a*	96	47	72.1	3.71	
Ashland *b*	......	......	......	4.38	
Ashton	......	......	......	3.51	
Auburn	96	46	70.8	5.86	
Aurora	98	41	72.0	5.83	
Bartley	99	41	73.2	1.88	
Beatrice	95	48	72.8	5.05	
Beaver	100	45	73.8	2.02	
Bellevue	......	......	......	3.97	
Benkleman	......	......	......	2.03	
Bethany	......	......	......	2.96	
Blair	94	45	70.3	2.72	
Bluehill	......	......	......	3.04	
Bradshaw	......	......	......	4.05	
Bridgeport	94	43	70.2	0.70	
Broken Bow	96	36	69.9	1.97	
Burchard	......	......	......	5.55	
Burge	......	......	......	3.01	
Burwell	......	......	......	2.88	
Callaway	95	40	70.8	5.89	
Central City	......	......	......	1.71	
Chester	......	......	......	1.93	
Cody	......	......	......	3.95	
Columbus	97	44	70.8	1.97	
Crete	96	43	71.2	1.57	
Culbertson	100	42	74.5	2.44	
Curtis	96	39	71.0	4.32	
David City	91	45	70.6	2.22	
Dawson	97	48	73.0	5.02	
Duff	......	......	......	2.33	
Dunning	......	......	......	3.23	
Ericson	......	......	......	1.42	
Ewing	......	......	......	1.74	
Fairbury	101	40	72.4	1.74	
Fairmont	97	43	70.2	2.61	
Fort Robinson	96	44	70.3	2.21	
Fremont	94	46	70.7	3.85	
Fullerton	......	......	......	3.40	
Geneva	102	42	73.9	1.41	
Genoa (near)	94	45	71.0	2.39	
Gering	98	44	72.7	0.54	
Gordan	......	......	......	1.14	
Gothenburg	96	46	70.8	5.10	
Grand Island *a*	99	44	72.8	6.83	
Grant	......	......	......	0.59	
Greeley	......	......	......	2.16	
Guide Rock	......	......	......	2.91	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Nebraska—Cont'd.	°	°	°	*Ins.*	*Ins.*
Haigler	......	......	......	1.18	
Halsey	97	41	70.5	3.06	
Hartington	94	41	66.8	5.06	
Harvard	98	41	70.6	1.77	
Hastings *[1]	100	48	71.4	1.84	
Hayes Center	......	......	......	3.51	
Hay Spring	98	36	68.6	1.92	
Hebron	97	44	73.0	1.78	
Highman	......	......	......	3.75	
Holbrook	......	......	......	2.71	
Holdrege	95	43	71.2	3.47	
Hooper *[1]	96	49	70.9	1.88	
Imperial	90	37	67.8	2.12	
Johnstown	......	......	......	2.21	
Kearney	98	41	71.9	3.54	
Kennedy	98	36	70.1	3.03	
Kimball	92	40	69.6	0.61	
Kirkwood	104[b]	40[e]	71.0[e]	5.29	
Leavitt	100	43	72.2	1.67	
Lexington	95	41	69.9	6.02	
Lockridge	101	43	71.8	3.09	
Lodgepole	91	43	69.8	2.25	
Loup	96	39	69.7	2.70	
Lynch	103	37	70.8	1.15	
McCook	......	......	......	2.96	
McCool Junction	......	......	......	2.79	
Madison	94	42	69.6	0.77	
Marquette	......	......	......	3.02	
Mason	......	......	......	6.55	
Merriman	......	......	......	1.50	
Minden	97	40	70.7	2.74	
Monroe	......	......	......	2.40	
Nebraska City	94	46	71.9	5.62	
Nemaha	......	......	......	6.67	
Norfolk	100	42	70.8	4.81	
North Loup	100	37	71.3	1.08	
Oakdale	97	41	69.6	3.11	
Odell	......	......	......	3.59	
O'Neil	98	42	70.9	3.19	
Ord	......	......	......	0.84	
Osceola	......	......	......	1.36	
Palmer	......	......	......	2.45	
Palmyra *[1]	98	52	72.6	3.75	
Pawnee City	98	43	72.4	5.01	
Plattsmouth *b*	......	43	......	2.81	
Purdum	98	40	70.4	2.40	
Ravenna *a*	97	42	71.2	4.50	
Ravenna *b*	......	......	......	4.60	
Redcloud	96	45	72.6	3.45	
Republican	......	......	......	6.06	
Rulo	......	......	......	4.85	
St. Libory	......	......	......	2.13	
St. Paul	99	42	72.8	1.59	
Santee	100[b]	44[e]	69.7[e]	5.05	
Schuyler	......	......	......	1.99	
Seneca	......	......	......	3.17	
Seward	100	45	71.4	5.26	
Smithfield	......	......	......	4.24	
Springview	101	40	71.8	2.12	
Stanton	94	43	69.3	3.18	
Strang	......	......	......	0.85	
Stratton	......	......	......	2.18	
Stromsburg	......	......	......	1.09	
Superior	99	46	72.2	2.13	
Syracuse	......	......	......	4.12	
Tablerock	......	......	......	4.06	
Tecumseh *b*	100[b]	40	71.9[d]	4.06	
Tekamah	96	46	71.6	1.94	
Turlington	96	50	71.6	4.38	
University Farm	98	45	72.6	2.48	
Wahoo	......	......	......	3.43	
Wakefield	95	40	69.3	4.09	
Wallace	......	......	......	1.42	
Wauneta	......	......	......	3.70	
Weeping Water	......	......	......	2.47	
Westpoint	96	45	70.6	3.28	
Whitman	......	......	......	2.40	
Wilber	......	......	......	3.15	
Wilsonville	......	......	......	2.02	
Winnebago	92	38	68.0	3.40	
Wisner	......	......	......	3.04	
Wymore	......	......	......	2.92	
York	......	......	......	3.74	
Nevada.					
Austin	88	46	67.8	1.13	
Battle Mountain	104	40	75.6	T.	
Beowawe *[1]	96	45	64.4	1.00	
Belmont	85	44	64.4	3.39	
Candelaria	90	54	71.0	6.05	
Carlin *[1]	98	40	72.2	......	
Carson City	94	39	68.4	0.22	
Cranes Ranch	......	......	......	1.27	
Dyer	95	41	69.6	1.63	
Elko	102	38	68.2	0.95	
Ely	92	39	66.2	2.53	
Eureka	99	30	65.5	3.40	
Geyser	96	36	66.0	3.09	
Glenbrook	......	......	......	0.05	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Nevada—Cont'd.	°	°	°	*Ins.*	*Ins.*
Golconda	......	......	......	0.60	
Halleck	......	......	......	0.30	
Hawthorne	98	53	76.4	1.70	
Lovelocks *[1]	102	40	73.6	0.00	
Martins	103	38	73.4	0.03	
Mill City	......	......	......	0.40	
Morey	97	46	70.0	2.86	
Palisade	98	36	68.6	0.44	
Palmetto	90	42	64.9	6.95	
Pioche	103	34	68.8	2.07	
Potts	99	31	64.7	1.96	
Reno State University	95	44	70.2	0.29	
Sodaville	105	51	76.3	3.69	
Tecoma	102	22	65.2	1.10	
Toano *[b]	94	49	73.4	0.40	
Wabuska	97	39	69.7	1.20	
Wadsworth	101	45	77.0	0.28	
Wells *[1]	92	58	67.5	0.00	
Wood	88	33	65.4	0.64	
New Hampshire.					
Alstead	84	40	64.6	3.21	
Bartlett	......	......	......	4.05	
Bethlehem	82	39	61.8	4.53	
Bretton Wood	......	......	......	4.48	
Brookline *[1]	92	48	67.7	4.67	
Chatham	88	39	61.9	4.05	
Durham	91	40	65.7	3.03	
Franklin Falls	89	38	65.3	3.82	
Grafton	90	35	63.0	3.43	
Hanover	88	37	64.7	3.73	
Jefferson Highlands	......	......	......	5.32	
Keene	90	36	65.6	5.37	
Littleton	82	40	60.9	4.94	
Nashua	93	42	68.0	4.52	
Newton	89	37	64.6	2.98	
North Woodstock	......	......	......	5.28	
Plymouth	92	38	65.8	4.18	
Stratford	83	34	62.0	4.21	
New Jersey.					
Asbury Park	87	53	71.8	9.68	
Bayonne	88	50	71.8	10.13	
Belvidere	......	......	......	5.07	
Bergen Point	86	50	71.0	8.95	
Beverly	91	48	72.7	7.06	
Blairstown	88	43	69.1	4.63	
Bridgeton	92	49	74.1	4.54	
Canton	......	......	......	5.98	
Cape May C. H.	86	48	72.2	2.71	
Charlotteburg	85	37	65.8	4.56	
Clayton	91	46	71.4	4.19	
College Farm	89	46	71.2	13.01	
Dover	85	43	66.4	4.86	
Elizabeth	88	52	70.6	8.01	
Englewood	85	45	69.0	7.50	
Flemington	87	45	71.0	5.69	
Friesburg	90	48	71.8	6.86	
Hightstown	88	48	71.2	8.80	
Imlaystown	86	47	71.6	10.09	
Indian Mills	92	47	72.2	4.30	
Lakewood	88	48	69.8	6.01	
Lambertville	89	46	71.4	6.25	
Layton	89	37	66.4	3.14	
Moorestown	89	48	71.1	7.08	
Newark	86	50	70.7	7.46	
New Brunswick	87	47	72.2	12.87	
Oceanic	84	55	70.6	8.72	
Paterson	87	49	71.0	6.21	
Phillipsburg	87	46	70.2	10.04	
Plainfield	86	47	70.2	10.45	
Pleasantville	......	......	......	2.71	
Rancocas	......	......	......	7.59	
Rivervale	89	40	68.4	2.86	
Salem	......	......	......	6.56	
Sandy Hook	86	59	72.0	8.23	
Somerville	88	44	70.0	8.81	
South Orange	85	50	69.2	7.71	
Sussex	87	43	68.3	3.92	
Trenton	87	51	72.3	9.81	
Tuckerton	88	45	71.3	6.02	
Vineland	92	48	72.2	5.39	
Woodbine	88	45	71.0	2.82	
Woodstown	......	......	......	4.76	
New Mexico.					
Alamagordo	103	55	79.0	2.01	
Albert	97	55	75.4	2.97	
Albuquerque	96	53	74.3	1.88	
Alma	94[j]	52[j]	72.9[j]	2.96	
Arabela	89	52	70.6	2.60	
Bellranch	......	......	......	2.81	
Cambray	100	......	......	1.19	
Carlsbad	102[i]	60[i]	81.9[i]	3.99	
Cloudcroft	72	40	56.0	3.69	
Deming	......	......	......	1.58	
Dorsey	90	46	69.6	1.47	
Eagle Rock Ranch	86	48	66.9	3.15	
Elk	87	50[e]	68.2[e]	1.24	
Engle	93	56	74.6	2.70	
Fort Bayard	91	52	70.3	4.42	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
New Mexico—Cont'd.					
Fort Stanton	88	46	67.2	2.92	
Fort Union	92	43	65.4	2.01	
Fort Wingate	85	50	66.6	5.65	
Fruitland	92	43	70.0	0.06	
Gage	......	......	......	1.35	
Gallinas Spring	96	54	74.9	2.14	
Golden	......	......	......	1.94	
Las Vegas	90	48	68.3	0.68	
Lordsburg	......	......	......	1.12	
Los Lunas	93	50	72.3	1.45	
Luna	90	45	67.0	1.80	
Maxwell (near)	88	45	66.6	1.21	
Mesilla Park	96	58	77.4	1.24	
Mountainair	94	45	67.0	2.45	
Rociada	88	42	62.5	2.35	
Roswell	97	56	75.9	0.83	
San Marcial	103	55	78.3	0.70	
San Rafael	90	49	67.8	3.02	
Springer	93	47	70.0	1.30	
Strauss	......	......	......	1.48	
Taos	96	46	68.0	1.18	
Vermejo	81	41	61.4	3.47	
Winsors	79	39	58.6	3.90	
New York.					
Adams	......	......	......	3.40	
Addison	93	38	66.2	3.76	
Akron	......	......	......	3.22	
Alden	86	42	65.8	3.17	
Ames	......	......	......	4.24	
Amsterdam	89	42	66.9	3.24	
Appleton	87	44	65.7	2.34	
Arcade	84[d]	34[d]	64.3[d]	3.09	
Athens	90	48	69.2	3.81	
Atlanta	87	37	65.2	3.08	
Atwater	......	......	......	3.56	
Auburn	90	45	67.6	2.70	
Avon	87	39	64.6	2.26	
Baldwinsville	85	45	66.3	2.15	
Ballston Lake	85	42	66.0	3.24	
Bedford	87	43	68.8	6.28	
Berlin	94	37	65.8	3.23	
Blue Mountain Lake	......	......	......	3.60	
Bolivar	85	32	63.0	4.61	
Bouckville	86	43	64.3	4.79	
Boyds Corners	......	......	......	5.16	
Brockport	91	44	67.4	3.22	
Cape Vincent	83	42	65.0	3.70	
Carmel	84	50	67.0	6.50	
Carvers Falls	85	43	65.8	2.93	
Chatham	94	43	68.5	3.90	
Chazy	88	42	65.2	3.44	
Cooperstown	83	41	63.4	4.55	
Cortland	89	40	66.4	4.50	
Cutchogue	83	52	69.3	3.99	
Dekalb Junction	86	41	64.7	3.21	
De Ruyter	83	38	63.2	3.90	
Easton	......	......	......	3.78	
Elba	88	44	66.1	3.24	
Elmira	92	41	68.6	3.61	
Faust	82	37	62.4	3.83	
Fayetteville	88	46	67.2	2.51	
Fort Plain	91	45	68.8	3.66	
Franklinville	85	33	63.1	2.30	
Gabriels	81	29	59.6	3.85	
Gansevoort	......	......	......	5.15	
Glens Falls	86	41	65.7	4.06	
Gloversville	88	39	64.8	4.67	
Greenwich	87	43	66.3	3.31	
Griffin Corners	82	33	62.0	4.77	
Harkness	85	42	65.2	2.74	
Haskinville	......	......	......	3.00	
Hemlock	84	46	67.3	2.17	
Hunt	84	38	63.9	2.02	
Indian Lake	81	28	60.7	4.08	
Ithaca	86	43	65.8	2.20	
Jamestown	87	36	64.8	2.75	
Jeffersonville	89	38	64.8	4.65	
Keene Valley	83	33	62.4	2.83	
Lake George	89	44	67.4	5.24	
Lenox	......	......	......	4.70	
Le Roy	87	44	65.6	2.50	
Liberty	84[c]	42[c]	63.7[c]	2.45	
Littlefalls, City Res.	86	44	65.3	4.15	
Lockport	84	47	66.1	3.03	
Lowville	84	35	63.3	3.08	
Lyndonville	......	......	......	3.26	
Lyons	92	45	69.4	1.85	
Middletown	87	49	67.9	4.92	
Mohonk Lake	82	50	65.4	7.90	
Moira	86	40	64.9	3.41	
Mount Ettrick	83[c]	45[c]	64.4[c]	5.84	
Newark Valley	......	......	......	5.06	
New Lisbon	83	36	61.5	4.41	
Number Four	78	37	60.5	5.00	
Ogdensburg	84	41	65.5	2.98	
Old Chatham	......	......	......	2.82	
Oneonta	87	42	66.7	7.13	
Oswegatchie	83	38	64.0	7.09	
New York—Cont'd.					
Otto	85	43	66.2	1.63	
Oxford	84	43	64.6	4.49	
Oyster Bay	83	52	68.8	10.60	
Palermo	......	......	......	3.78	
Perry City	88	38	64.2	3.10	
Plattsburg Barracks	90	37	63.8	4.73	
Port Jervis	90	44	68.6	5.53	
Potsdam	86	38	65.1	3.78	
Primrose	87	43	68.3	8.15	
Redhook	......	......	......	4.94	
Richmondville	86	43	66.0	4.20	
Ridgeway	85	47	66.4	2.67	
Ripley	85	45	65.5	2.45	
Rome	......	......	......	5.85	
Romulus	87[g]	46[g]	63.6[g]	......	
Salisbury Mills	......	......	......	5.52	
Saranac Lake	81	33	61.8	3.19	
Saratoga Springs	85	43	66.2	5.37	
Scarsdale	88	50	67.8	5.39	
Scottsville	......	......	......	2.68	
Setauket	84	56	69.2	7.51	
Shortsville	88	46	66.4	1.79	
Skaneateles	......	......	......	2.11	
Southampton	82	50	68.6	6.17	
South Butler	88[l]	40	65.4[c]	2.27	
South Canisteo	86	37	64.2	3.80	
Southeast Reservoir	......	......	......	6.43	
South Kortright	84	37	63.4	6.33	
South Schroon	81	35	62.2	3.46	
Spier Falls	86	42	66.2	4.61	
Straits Corners	91	36	64.1	3.52	
Ticonderoga	......	......	......	2.92	
Volusia	84	46	63.4	2.62	
Wappinger Falls	89	46	68.4	3.92	
Warwick	......	......	......	3.95	
Watertown	86	44	65.8	3.16	
Waverly	93	35	67.0	3.31	
Wedgwood	85	45	63.9	4.85	
Wells	86	35	62.9	5.23	
West Berne	89	40	67.2	3.08	
Westfield	86	48	65.4	2.54	
Windham	86	38	64.7	3.75	
Youngstown	......	......	......	3.24	
North Carolina.					
Brevard	90	52	71.9	5.51	
Brewers	92[l]	47	72.5	5.13	
Bryson City	......	......	......	3.67	
Currituck	......	......	......	9.16	
Eagletown	91	56	75.0	7.33	
Edenton	89	56	75.4	5.33	
Fayetteville	95	55	76.7	8.41	
Flatrock	89	50	71.4	7.51	
Goldsboro	95	57	77.3	7.32	
Graham	......	......	......	4.42	
Greensboro	91	53	75.0	4.26	
Henderson	90[c]	58[c]	74.7[c]	4.06	
Hendersonville	87	50	70.4	6.31	
Henrietta	95	54	76.0	7.74	
Horse Cove	85	54	68.8	11.30	
Hot Springs	87	54	72.8	......	
Jefferson	86[d]	43[d]	67.2[d]	4.65[d]	
Kinston	98	57	78.2	3.58	
Kittyhawk	89	64	77.0	5.52	
Lenoir	91	48	75.8	7.12	
Lexington	95	52	75.0	3.07	
Lincolnton	94	......	......	......	
Linville	77	40	63.6	5.63	
Littleton	95	55	74.6	4.31	
Louisburg	94	56	76.8	3.00	
Lumberton	98	55	78.6	8.30	
Moncure	97	50	77.6	7.61	
Monroe	95	54	75.6	11.89	
Morganton	93	49	74.0	7.03	
Mountairy	92[h]	51[h]	74.2[h]	4.92	
Mount Holly	......	......	......	7.06	
Murphy	......	......	......	8.49	
Nashville	98	54	78.0	3.94	
Newbern	94	60	78.0	9.30	
Pantego	......	......	......	6.10	
Patterson	89	48	70.0	5.48	
Penelo	95	54	76.5	5.52	
Pinehurst	95	53	77.4	10.84	
Pittsboro [h]	96	50	76.2	......	
Reidsville	......	......	......	4.83	
Salem	92	52	74.4	6.53	
Salisbury	98	53	75.6	4.84	
Saxon	90	55	71.6	4.62	
Scotland Neck	93	55	76.8	5.33	
Selma	101	55	79.8	4.82	
Settle	91	54	75.0	5.15	
Sloan	95	57	76.6	5.06	
Soapstone Mount	93	50	71.6	8.00	
Southern Pines *a*	98	53	78.4	10.36	
Southport	91	59	78.8	11.20	
Statesville	93	54	74.2	6.60	
Tarboro	98	56	78.4	5.28	
Washington	99	52	78.3	6.07	
Waynesville	88	53	70.7	3.12	
North Carolina—Cont'd.					
Weldon *a*	97	53	77.5	4.12	
Weldon *b*	......	......	......	4.26	
Whiteville	96	55	77.2	9.34	
North Dakota.					
Amenia	90	38	63.7	1.12	
Ashley	92	33	62.5	1.26	
Berlin	93	39	63.2	0.53	
Buxton	84[j]	41[j]	62.0[j]	1.79	
Cando	85	34	59.4	5.37	
Churchs Ferry	89	36	61.4	3.35	
Coalharbor	90	42	64.3	1.93	
Cooperstown	88	34	60.6	1.92	
Devils Lake	93	32	62.2	1.82	
Dickinson	102	35	66.8	2.68	
Donnybrook	95	38	63.0	1.32	
Dunseith	88	35	61.0	3.39	
Edgeley	94	40	64.3	0.42	
Ellendale	96	37	65.6	0.63	
Fargo	91	38	64.0	0.69	
Forman	92	39	66.0	0.75	
Fort Yates	98	44	68.2	1.42	
Fullerton	93	35	63.8	0.67	
Glenullin	94	41	66.0	1.59	
Grafton	83[g]	42[g]	62.7[g]	1.75	
Hamilton	86	40	61.4	3.07	
Jamestown	97	40	65.1	0.45	
Kulm	92	37	64.0	0.67	
Lamoure	......	......	......	0.69	
Langdon	82	39	58.0	3.40	
Larimore	89	41	61.4	3.29	
Lisbon	95	39	64.4	0.40	
McKinney	94	31	59.2	1.10	
Manfred	92	34	62.2	1.19	
Mayville	91	40	64.9	1.18	
Medora	99	38	66.2	0.67	
Melville	94[c]	37[c]	65.7[c]	0.20	
Milton	86[f]	40[f]	62.0[f]	1.81	
Minnewaukon	90	40	62.6	1.73	
Minot	98	38	66.3	3.65	
Minto	87	37	60.8	1.80	
Napoleon	98	37	64.7	0.40	
New England	100	38	63.4	......	
Oakdale	94	40	65.5	1.21	
Park River	88	42	63.0	2.15	
Pembina	85	38	60.7	2.95	
Portal	90	36	60.2	1.57	
Power	93	39	65.2	0.71	
Rolla	89	41	60.9	1.74	
Rugby	88	35	61.0	3.08	
Steele	94[c]	35[c]	62.9[c]	0.30	
Townsend	......	......	......	0.14	
University	84	40	61.3	2.79	
Wahpeton	88	42	65.4	0.72	
Walhalla	87	40	61.8	3.11	
Willow City	91	33	59.4	3.08	
Wishek	95	33	62.4	0.74	
Ohio.					
Amesville	95	42	71.2	2.72	
Atwater	......	......	......	4.10	
Bangorville	88	47	68.0	2.94	
Bellefontaine	87	47	67.6	2.04	
Benton Ridge	88	45	68.0	1.54	
Bowling Green	88	42	67.2	1.45	
Bucyrus	88	44	66.7	2.74	
Cadiz	90	47	68.8	2.26	
Cambridge	92	42	69.2	2.02	
Camp Dennison	97	46	73.0	0.69	
Canal Dover	89	41	67.0	3.31	
Canton	86	45	66.0	3.08	
Cardington	90	40	66.9	1.74	
Circleville	92	47	70.7	1.38	
Chillicothe	94[b]	39	70.6[c]	4.49	
Clarington	94	49	72.4	1.78	
Clarksville	92	50	72.4	2.85	
Cleveland *a*	88	49	66.7	2.55	
Cleveland *b*	89	49	66.6	2.28	
Clifton	91	47	69.8	1.88	
Coalton	92	43	71.0	4.38	
Dayton *a*	......	......	......	0.68	
Dayton *b*	96	45	71.6	1.87	
Defiance	91	43	67.9	1.88	
Delaware	93	42	67.8	2.62	
Demos	91	47	69.6	2.75	
Elyria	90	44	65.6	3.02	
Findlay	91	45	69.4	1.58	
Frankfort	91	44	71.0	4.40	
Fremont	89	46	69.2	3.23	
Garrettsville	88	39	64.4	3.14	
Granville	92	43	68.7	1.96	
Gratiot	89	44	68.1	2.50	
Green	94	48	73.5	3.25	
Greenfield	89	51	71.8	2.53	
Greenhill	88	38	64.8	2.87	
Greenville	92	45	69.8	1.70	
Hanging Rock	94	50	73.8	2.95	
Hedges	91	40	67.6	2.73	
Hillhouse	88	39	64.2	3.90	
Hiram	85	47	66.2	2.55	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Ohio—Cont'd.					
Hudson	89	42	66.1	4.08	
Jacksonburg	95	50	73.6	1.99	
Kenton	89	48	69.2	1.33	
Killbuck	88	42	66.4	1.83	
Lancaster	90	45	68.5	3.06	
McConnelsville	91	44	69.3	3.03	
Manara	90	41	69.2	1.60	
Mansfield				3.14	
Marietta	89	49	71.6	0.71	
Marion	92	43	70.2	2.04	
Medina	88	41	66.8	3.70	
Milfordton	91	42	67.2	3.97	
Milligan	91	40	68.1	3.31	
Millport	88	39	65.2	3.25	
Montpelier	88	45	67.0	4.02	
Napoleon	85	45	67.7	1.87	
Nellie	89	47	67.8	2.23	
New Alexandria	90	43	68.0	3.32	
New Berlin	87	43	66.8	4.40	
New Bremen	95	43	66.8		
New Richmond	94	51	74.6	1.46	
New Waterford	86	42	65.8	3.53	
North Lewisburg	91	46	68.6	2.45	
North Royalton	87	47	65.8	2.91	
Norwalk	88	44	67.2	3.76	
Oberlin	88	43	66.0	5.57	
Ohio State University	91	45	68.2	3.54	
Orangeville	90	38	65.0	4.07	
Ottawa	90	44	69.2	2.16	
Pataskala	90	43	68.4	3.16	
Philo	92	48	70.8	2.56	
Plattsburg	91	47	69.6	3.12	
Pomeroy	93	48	71.4	2.41	
Portsmouth *a*				3.22	
Portsmouth *b*	90	50	72.6	3.73	
Pulse	90	48	71.2	2.20	
Rittman	91	40	66.6	3.38	
Rockyridge	90	45	68.9	2.32	
Shenandoah	87	43	65.6	2.81	
Sidney	91	44	70.0	1.78	
Somerset	92	48	71.2	3.20	
Springfield				2.12	
Thurman	96	49	73.4	2.92	
Tiffin	87	48	67.5	2.42	
Upper Sandusky	89	45	68.6	2.55	
Urbana	92	46	69.5	2.82	
Vickery	88	43	67.9	2.38	
Warren	90	42	66.3	3.23	
Wauseon	90	42	66.7	2.97	
Waverly	93	46	72.8	3.39	
Waynesville	92	48	71.2	3.03	
Wellington	92	44	67.8	2.74	
Willoughby				2.12	
Wooster	90	42	66.7	2.03	
Zanesville				2.82	
Oklahoma.					
Alva	105	58	80.4	3.34	
Arapaho	105	57	79.2	2.25	
Beaver	101	54	77.2	1.53	
Binger	103[c]	57[c]	78.2[c]	2.73	
Busch	104	55	78.0	1.53	
Chandler	101	60	79.4	4.92	
Cloud Chief	105	57	78.5	2.78	
Eldorado	104	60	81.5	2.26	
Enid	103	58	78.8	6.06	
Fort Reno	104	56	79.2	3.05	
Fort Sill	101	61	78.8	2.50	
Frederick	102	62	81.3	2.39	
Gage	98	56	77.0	5.31	
Grand	102	52	78.0	2.31	
Guthrie	95	60	77.6	7.21	
Harrington	100	53	76.7	1.46	
Hennessey	106	58	79.4	3.00	
Hobart	107	59	80.8	2.75	
Jefferson	100	58	78.6	6.93	
Jenkins	99	56	77.2	5.54	
Kenton	97	53	75.6	0.83	
Kingfisher	103	59	80.0	3.07	
McComb	98	60	77.8	3.15	
Mangum	104	60	81.5	1.50	
Meeker	100	58	78.6	3.79	
Newkirk	99	57	77.8	7.30	
Norman	104	58	80.6	2.23	
Pawhusha	98	54	77.6	3.50	
Perry	96	58	77.5	4.55	
Sac and Fox Agency	94	64	78.8	2.00	
Shawnee	100	60	79.1	3.64	
Stillwater	96	59	77.4	7.42	
Taloga	112	58	81.3	1.68	
Temple	103	61	81.6	1.98	
Waukomis	106	57	79.2	3.60	
Weatherford	103	56	78.2	3.38	
Whiteagle	96	57	77.2	7.58	
Woodward	100	57	78.8	2.95	
Oregon.					
Albany				0.22	
Alpha	93	36	63.2	0.10	
Arlington	103	49	76.3	T.	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Oregon—Cont'd.					
Ashland	99	42	69.8	T.	
Astoria	74	49	60.6	0.09	
Aurora (near)	94	43	66.0	0.46	
Bay City	72	40	56.4	0.95	
Bend	97	28	64.0	0.33	
Beulah	100	29	67.6	0.23	
Blackbutte	98	43	66.9	0.20	
Blaloch	110	51	83.4	T.	
Bullrun				0.42	
Burns	99	34	68.8	0.15	
Butter Creek				T.	
Cascade Locks	94	45	69.6	0.31	
Condon	101	39	69.3	T.	
Coquille				T.	
Corvallis	93	42	66.4	0.11	
Dayville	97	38	68.8	0.06	
Detroit	105	35	68.4	0.52	
Doraville	94	44	63.6	0.27	
Drain	97	38	66.3	0.08	
Ella				0.05	
Fairview	87	38	60.9	T.	
Falls City	95	40	64.8	0.05	
Forestgrove	100	38	65.9	T.	
Gardiner	75	45	56.8	0.00	
Glendale	101	35	67.0	0.00	
Glenora	95	35	64.0	0.16	
Gold Beach	71	40	55.8	T.	
Government Camp	90	32	58.8	1.02	
Grants Pass	106	38	70.6	T.	
Grass Valley	99	33	64.5	T.	
Heppner	98	40	68.6	0.00	
Hood River	99	45	69.6	0.38	
Huntington	103	36	76.6	0.00	
Jacksonville	100	44	72.6	0.33	
Joseph	92	37	65.8	0.75	
Kerby	102[c]	37[c]	68.9[c]	0.00	
Lagrande	98	33	69.2	0.29	
Lakeview	102	35	69.5	0.03	
Lonerock	103	37	68.4	T.	
McKenzie Bridge	100	33	65.8	0.34	
McMinnville	99	39	66.0	0.10	
Meacham				0.35	
Monroe	95	43	67.0	0.07	
Mount Angel	97	48	69.9	0.47	
Nehalem				0.17	
Newport	68	43	54.8	0.21	
Ontario				0.10	
Paisley	97	45	71.8		
Pendleton	109	32	70.8	T.	
Pine	98	29	64.9	0.20	
Prineville	98	33	64.6	0.25	
Riverside	104	29	72.0	0.70	
Salem	95	48	68.0	0.14	
Silverlake	96	20	60.8	0.00	
Sparta	99	44	72.3	0.04	
Stafford	99	43	68.0	0.30	
The Dalles	102	46	72.4	0.04	
Toledo	86	41	59.5	0.04	
Umatilla	108	49	77.2	0.00	
Vale	102	30	69.0	0.44	
Wallowa	98	29	65.4	0.20	
Wamic	100	35	66.7	0.12	
Warm Spring	104	38	70.2	1.95	
Weston	101	38	70.7	0.07	
Williams	100	37	69.0	0.03	
Pennsylvania.					
Aleppo	90	40	68.6	3.23	
Altoona	92[j]	43[j]	68.1[j]	1.69	
Beaver Dam				4.09	
Brookville				3.18	
Browers				5.26	
California	92	47	70.4	5.32	
Cassandra	87	38	63.6	3.20	
Centerhall	88	40	67.6	3.01	
Clarion				4.61	
Claysville	91	40	68.0	2.09	
Coatsville	89	47	71.0	4.86	
Coudersport	85	36	62.8	5.55	
Confluence				4.08	
Davis Island Dam				2.78	
Derry	90	39	68.1	2.93	
Doylestown				8.39	
Dushore	89	35	65.0	3.95	
East Bloomsburg				3.02	
East Mauch Chunk	91	41	69.2	4.51	
Easton	86	45	69.4	9.64	
Ellwood Junction				3.49	
Emporium	86	44	66.4	4.13	
Ephrata	87	45	70.0	3.67	
Everett	91	41	67.7	1.66	
Forks of Neshaminy				8.18	
Freeport	92	44	69.8	3.39	
Gettysburg	85	49	70.3	3.92	
Girardville				4.04	
Gordon	91	36	66.3	3.89	
Grampian	84[c]	34[c]	63.8[c]		
Greensboro				2.58	
Greenville	89	40	65.6	4.11	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Pennsylvania—Cont'd.					
Hamburg	92	45	71.5	8.64	
Herrs Island Dam				3.00	
Huntingdon *a*				3.09	
Huntingdon *b*	91	41	68.0	4.38	
Indiana	89	39	67.0	3.45	
Irwin	91[d]	41[d]	69.8[d]	3.67	
Johnstown	92	45	70.2	3.93	
Keating				2.66	
Kennett Square	85	49	70.6	6.92	
Lansdale				4.96	
Lawrenceville	90	36	64.9	2.68	
Lebanon	89	42	69.8	5.56	
Leroy	88	45	65.8	4.80	
Lewisburg	92	43	69.0	3.76	
Lockhaven *a*	96	44	69.9	4.09	
Lockhaven *b*				3.69	
Lock No. 4				2.42	
Lycippus	87	45	68.6	3.76	
Marion	89	43	69.0	1.75	
Mifflin				2.51	
Mifflintown	89	43	68.1	3.37	
Milford	91	40	67.0	5.35	
Montrose	88	40	64.6	5.40	
New Germantown	89	43	68.0	4.45	
Oil City				4.02	
Ottsville				5.69	
Parker				3.96	
Philadelphia	88	55	73.5	6.59	
Pocono Lake	84	34	62.6	3.58	
Point Pleasant				7.48	
Pottsville				5.25	
Quakertown	86	44	69.6	7.67	
Reading	87	45	72.4	7.51	
Saegerstown	88	37	64.0	3.52	
St. Marys	85	38	64.0	2.87	
Saltsburg				3.39	
Seisholtzville				7.11	
Selinsgrove	91	44	71.0	2.53	
Shawmont				9.26	
Skidmore	88	42	66.4	6.35	
Smethport	85	38	64.0	6.66	
Smiths Corners				6.82	
Somerset	85	36	64.4	2.36	
South Eaton	87	42	67.6	3.40	
Springmount				4.47	
State College	86	43	66.9	1.74	
Towanda	88	40	66.0	4.32	
Troutrun				3.53	
Uniontown	90	45	69.6	3.61	
Warren	86	39	64.8	3.07	
Wellsboro	90	41	66.4		
Westchester	86	51	71.2	5.92	
West Newton				2.75	
Wilkesbarre	91	44	68.0	5.58	
Williamsport	91	45	69.3	2.13	
Rhode Island.					
Bristol	80	50	68.0	2.78	
Kingston	83	45	66.2	7.63	
Pawtucket	85	49	68.3	9.01	
Providence *a*	88	53	71.3	5.12	
Providence *c*	84	50	68.2	5.41	
South Carolina.					
Aiken	101	56	79.6	3.92	
Allendale	98	61	79.1	8.94	
Anderson	97	57	77.5	12.13	
Barksdale	94	57	77.8	11.68	
Batesburg	97	56	77.4	7.64	
Beaufort	94	61	79.4	11.45	
Bennettsville	97	55	77.6	6.00	
Blackville	99	59	79.3	7.83	
Bowman	98	58	78.6	7.59	
Calhoun Falls				5.75	
Camden				5.11	
Cheraw *a*	93	54	76.8	6.52	
Cheraw *b*				5.95	
Clarks Hill	96	61	77.8	5.60	
Clemson College	93	57	76.7	9.48	
Conway	96	59	78.2	9.48	
Dillon	99	56	78.5	5.56	
Edisto				7.88	
Effingham				13.43	
Florence	99	57	78.8	7.41	
Gaffney	95	56	77.5	9.86	
Georgetown	92	61	78.4	4.63	
Gillisonville	98	61	78.4	8.75	
Greenville	88	54	72.4	12.19	
Greenwood	93	56	76.8	11.02	
Heath Springs	97	62	78.4	12.09	
Kingstree *a*	93	58	76.8	6.85	
Kingstree *b*				7.62	
Liberty	92	57	75.8	8.64	
Little Mountain	97	56	77.6	7.20	
Newberry	96	57	78.0	6.78	
Pinopolis *[1]	90	62	76.1	11.43	
St. Georges	94	59	78.5	6.75	
St. Matthews	93	59	77.4	7.67	
St. Stephens				10.96	
Saluda	96	56	77.4	8.87	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
South Carolina—Cont'd.					
Santuck	96	55	74.8	9.57	
Seivern	99	57	78.4	5.65	
Smiths Mills	.....	.....	.....	11.90	
Society Hill	93	56	77.2	9.64	
Spartanburg	96	55	76.9	11.79	
Statesburg	94	57	77.4	9.18	
Summerville	93	60	77.2	8.68	
Sumter[c]	102	65	81.8	.....	
Trenton	100	56	78.0	8.30	
Trial	96	59	77.6	6.53	
Walhalla	94	57	75.6	10.46	
Walterboro	94	60	77.4	11.22	
Winnsboro	96	56	77.0	4.96	
Winthrop College	94	55	76.2	10.99	
Yemassee	94	61	78.1	7.53	
Yorkville	95	55	77.0	11.30	
South Dakota.					
Aberdeen	94	39	66.3	3.98	
Academy	103	42	72.2	2.48	
Alexandria	104	38	70.2	2.44	
Armour	102	38	71.2	2.10	
Bowdle	96	39	66.6	2.45	
Brookings	95	34	65.2	0.93	
Canton	96	37	68.0	2.00	
Cavite	104	36	72.2	0.15	
Centerville	.....	.....	.....	1.55	
Chamberlain	104	45	73.8	1.65	
Cheyenne	100	44	70.8	2.95	
Clark	97	42	65.4	1.16	
Clear Lake	90	44	66.4	2.99	
DeSmet	99	39	66.8	1.46	
Doland	98	36	68.4	4.32	
Elkpoint	98	41	70.4	2.45	
Fairfax	101	43	70.1	1.88	
Farmingdale	.....	.....	.....	0.51	
Faulkton	97	43	67.2	1.90	
Flandreau	92	37	65.5	2.12	
Forestburg	103	38	68.3	4.15	
Fort Meade	99	45	70.6	2.35	
Gannvalley	104	39	70.9	0.97	
Grand River School	100	37	69.0	1.43	
Greenwood	103	44	72.2	1.94	
Herreid	105	38	66.8	1.60	
Highmore	102	42	71.4	1.48	
Hitchcock	.....	.....	.....	3.57	
Hotch City	104	39	72.5	1.05	
Howard	100	40	68.8	2.87	
Howell	101	38	68.3	1.33	
Ipswich	99	40	66.1	2.97	
Kidder	93	34	63.2	1.50	
Kimball	102	40[h]	69.8[f]	2.28	
Leola	102	37	67.8	2.66	
Leslie	104	38	72.0	1.91	
Marion	96[e]	41[e]	68.9[e]	2.37	
Mellette	97	39	67.4	2.35	
Menno	99	42	69.6	3.35	
Millbank	95	40	66.2	3.42	
Mitchell	101	41	68.8	1.89	
Oelrichs	100	37	71.8	T.	
On-the-Trees Camp	100	40	70.2	1.66	
Plankinton	101	38	69.2	1.65	
Ramsey	97	30	66.0	0.83	
Redfield	99	39	67.4	1.72	
Rosebud	.....	.....	.....	0.51	
Sioux Falls	101	40[c]	68.8	1.62	
Sisseton Agency	88	43	64.0	4.70	
Spearfish	93	45	66.2	2.85	
Stephan	102	36	70.2	0.93	
Tyndall	99	40	69.2	5.37	
Vermillion	99	44	71.4	1.91	
Watertown	93	37	64.3	2.27	
Wentworth	99	41	68.2	2.26	
Wolsey	.....	.....	.....	1.72	
Tennessee.					
Andersonville	91	56	74.4	2.30	
Arlington	94	56	77.8	1.52	
Ashwood	.....	.....	.....	2.67	
Benton	94	59	76.5	7.25	
Bluff City	.....	.....	.....	3.27	
Bolivar	95	54	77.2	1.93	
Bristol	83	50	73.0	3.09	
Brownsville	95	56	77.9	2.03	
Byrdstown	90	55	75.1	1.66	
Carthage	97	60	77.5	2.09	
Cedar Hill	97	51	77.2	3.50	
Celina	.....	.....	.....	2.36	
Charleston	.....	.....	.....	4.96	
Clarksville	96	55	78.8	3.05	
Clinton	.....	.....	.....	5.46	
Covington	94	56	78.2	1.23	
Decatur	.....	.....	.....	2.29	
Dickson	98[c]	47[c]	77.0[c]	2.28	
Dover	101	50	78.0	2.35	
Dyersburg	95	58	77.6	2.38	
Elizabethton	90	49	74.0	4.75	
Erasmus	89	50	71.8	4.36	
Florence	92	59	76.6	2.52	
Franklin	95	59	76.0	2.25	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Tennessee—Cont'd.					
Grace	.....	.....	.....	7.50	
Greeneville	89	52	73.4	3.35	
Halls Hill	.....	.....	.....	3.52	
Harriman	91	56	75.0	3.15	
Hohenwald	96	49	74.6	1.32	
Iron City	97	57	77.5	1.34	
Isabella	91	58	74.4	4.52	
Jackson	98	49	76.8	1.98	
Johnsonville	99	57	78.6	2.65	
Jonesboro	88	50	72.4	3.29	
Kenton	97	50	76.6	2.15	
Kingston	.....	.....	.....	3.24	
Lafayette	95	52	76.4	2.24	
Leadvale	.....	.....	.....	1.60	
Lebanon	96	55	77.8	1.04	
Lewisburg	101	56	79.2	1.24	
Loudon	.....	.....	.....	3.79	
Lynnville	93	60	75.7	2.77	
McMinnville	93	57	75.8	4.38	
Maryville	94	50	75.8	2.90	
Milan	95	53	76.9	2.62	
Monterey	87	56	73.3	6.77	
Newport	88	56	74.7	2.91	
Palmetto	94	59	77.0	4.71	
Pope	101	58	79.4	1.80	
Rogersville	91	52	74.0	4.04	
Rugby	93	49	72.8	2.00	
Savannah	99	60	80.2	2.71	
Sewanee	88	56	73.2	3.51	
Silverlake	82	48	68.0	4.46	
Springdale	98	51	74.8	4.87	
Springville	99	47	77.0	1.60	
Tazewell	.....	.....	.....	3.74	
Tellico Plains	93	59	76.3	4.92	
Tracy City	87	55	72.0	4.87	
Trenton	97	53	77.6	1.99	
Tullahoma	94	58	76.2	6.05	
Walling	.....	.....	.....	3.26	
Waynesboro	98	54	77.2	1.60	
Wildersville	89	56	75.6	3.77	
Yukon	92	58	76.2	3.21	
Texas.					
Alvin	.....	.....	.....	5.02	
Arthur	.....	.....	.....	0.18	
Athens	106	60	82.5	0.26	
Austin	96	68	82.9	3.71	
Ballinger	100	64	82.2	0.92	
Beaumont	101	69	82.8	4.76	
Bigspring	104	62	81.0	2.27	
Blanco	96	60	79.4	3.94	
Boerne	96	61	76.6	4.16	
Bonham	101[f]	52[f]	81.4[f]	0.56	
Booth	.....	.....	.....	3.74	
Bowie	102	63	82.3	1.73	
Brazoria	91	64	79.6	4.84	
Brenham	95	67	80.2	4.07	
Brighton	91	69	82.1	0.53	
Brownwood	109	64	84.8	0.10	
Burnet	100	61	81.0	1.97	
Channing	97[f]	54	76.0[c]	2.56	
Childress	102	59	80.8	2.67	
Clarendon	98	66	81.4	4.00	
Claytonville	100	59	80.7	2.07	
Coleman	98	65	81.2	1.35	
College Station	102[f]	66	82.0[c]	3.60	
Colorado	106	61	82.4	1.77	
Columbia	91	65	79.4	6.16	
Columbus	.....	.....	.....	T.	
Comanche	105[h]	60[h]	81.5[h]	2.45[h]	
Comstock	99	68	83.6	0.09	
Corsicana	101	66	83.0	2.06	
Crockett	98	62	79.6	3.50	
Cuero	97	69	82.8	1.89	
Dallas	102	63	82.2	1.52	
Danevang	97	59	81.2	2.98	
Dialville	96	64	79.2	5.08	
Dublin	93	68	82.0	T.	
Duval	97	69	81.3	1.65	
Estelle	100	64	81.8	3.84	
Fort Brown	97	67	83.0	4.47	
Fort Clark	99	70	84.0	0.35	
Fort Davis	91	53	73.4	1.57	
Fort McIntosh	102	70	86.3	0.65	
Fort Ringgold	102	69	84.8	0.65	
Fort Stockton	100[e]	59[e]	78.0[e]	1.66	
Fredericksburg	97[e]	61[e]	81.1[e]	2.30	
Gainesville	100	63	81.2	0.75	
Gatesville	.....	63	.....	0.40	
Graham	105	52	83.8	2.83	
Grapevine	102	66	83.0	1.41	
Greenville	102	63	83.0	1.37	
Hale Center	99	61	76.3	3.35	
Hallettsville	96	67	81.6	2.58	
Haskell	107	64	82.8	1.74	
Hearne	105	61	81.8	6.36	
Hempstead	.....	.....	.....	3.77	
Hewitt	.....	.....	.....	1.10	
Hillsboro	101	64	81.7	1.22	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Texas—Cont'd.					
Hondo	100	65	84.6	0.90	
Houston	96	68	81.3	4.10	
Huntsville	101	63	82.6	1.87	
Ira	102	61	80.9	1.49	
Jefferson	95	55	78.6	2.16	
Jewett	100	60	80.2	1.59	
Junction	.....	.....	.....	0.79	
Kaufman	101	65	83.2	1.40	
Kent	96	56	76.4	0.88	
Kerrville	98	55	79.4	1.82	
Knickerbocker	100	60	80.9	1.81	
Lampasas	100	60	80.7	0.86	
Lapara	.....	.....	.....	2.22	
Liberty	100	.....	.....	2.85	
Llano	.....	.....	.....	3.10	
Longview	99	61	82.0	2.28	
Luling	98	63	80.8	2.84	
McKinney	98	55	82.3	1.03	
Marlin	103	62	82.0	0.98	
Menardville	99	58	78.2	2.07	
Midland	94[f]	60[f]	85.0[f]	0.50	
Mount Blanco	98	58	76.6	2.18	
Nacogdoches	98	61	81.2	3.56	
New Braunfels	95	64	81.2	1.35	
Orange	.....	.....	.....	2.40	
Panter	.....	.....	.....	3.97	
Paris	104	60	82.2	2.85	
Pearsall	100	69	84.5	0.87	
Pecos	.....	.....	.....	1.00	
Pierce	95	65	80.8	2.21	
Port Lavaca	94	68	80.8	3.33	
Rhineland	104	60	80.2	2.60	
Riverside	.....	.....	.....	1.41	
Rockisland	95	65	80.2	2.60	
Rockland	97	.....	.....	4.08	
Rockport	90	70	79.3	2.68	
Runge	102	60	84.8	0.19	
Sabinal	99	63	81.6	0.00	
San Marcos	97	62	81.2	4.25	
San Saba	99	60	81.1	0.81	
Santa Gertrudes Ranch	.....	.....	.....	0.16	
Sherman	95	61	82.5	0.74	
Sonora	98	55	78.8	3.88	
Sugarland	95	64	79.7	2.39	
Sulphur Springs	98	59	80.4	3.43	
Temple *a*	96	65	80.2	4.57	
Temple *b*	99	66	81.1	4.26	
Tilden	101	.....	.....	0.50	
Trinity	101	63	81.4	4.70	
Tulia	98	55	74.9	3.07	
Tyler	100	61[d]	82.0	0.40	
Vernon	102	61	82.0	3.44	
Victoria	97	66	82.2	2.17	
Waco	101	66	84.2	1.06	
Waxahachie	102	61	82.4	1.17	
Weatherford	100	65	83.0	1.04	
Wharton	100	63	82.0	4.37	
Wichita Falls	.....	.....	.....	3.10	
Utah.					
Alpine	.....	.....	.....	1.62	
Beaver	83[e]	36[e]	66.6[e]	1.13	
Blackrock	90	34	67.9	0.56	
Blacksmith Fork	.....	.....	.....	2.87	
Bluecreek	.....	.....	.....	0.61	
Callao	94	32	69.4	0.54	
Castledale	90	30	64.4	0.35	
Castle Rock	.....	.....	.....	2.52	
Cisco	103	52	78.5	0.18	
Corinne	102	43	77.7	0.46	
Coyoto	78	31	55.0	0.95	
Desert	98	29	70.1	0.20	
Emery	83	34	60.2	0.93	
Escalante	90	47	69.0	2.58	
Experiment Farm	104	46	77.8	.....	
Farmington	93	36	70.2	0.58	
Fillmore	103	41	75.0	1.13	
Fort Duchesne	95	56	70.3	0.66	
Frisco	96	47	71.6	0.83	
Garrison	98	38	69.9	0.93	
Giles	98	42	72.6	1.28	
Government Creek	94	39	71.9	2.02	
Green River	102	99	76.2	0.72	
Heber	92	27	64.8	0.88	
Henefer	93	25	64.9	1.39	
Hite	104	60	82.0	1.06	
Huntsville	.....	.....	.....	0.67	
Ibapah	94	26	66.2	0.91	
Kanab	92[h]	41[h]	68.2[h]	1.40	
Kelton	99	34	70.8	0.00	
La Sal	84	44	65.4	2.95	
Levan	92	38	69.6	1.24	
Manti	93[c]	35[c]	68.7[c]	0.37	
Marysvale	89	34	65.6	2.10	
Meadowville	88	32	63.4	0.55	
Millville	.....	.....	.....	0.91	
Moab	101	41	77.0	0.97	
Monticello	86	45	64.3	3.91	
Morgan	91	29	64.2	1.27	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Utah—Cont'd.	°	°	°	*Ins.*	*Ins.*
Mount Nebo	95	40	72.9	0.54	
Mount Pleasant	95	41	70.4	0.44	
Nephi	.....	.....	.....	0.07	
Ogden	93	43	72.4	0.55	
Panquitch	.....	.....	.....	3.10	
Parowan	97	43	67.9	1.23	
Payson	.....	.....	.....	T.	
Pine Valley	.....	.....	.....	3.62	
Pinto	91	40	66.2	1.97	
Plateau	88	28	63.2	1.31	
Promontory *[1]	98	43	69.4	0.00	
Provo	98	34	70.4	0.45	
Ranch	90[c]	41[c]	63.4[c]	3.01	
Randolph	.....	.....	.....	1.01	
Richfield	92[g]	34[g]	67.5[g]	0.37[g]	
Rockwell	104	60	80.8	1.46	
St. George	104	52	78.5	1.50	
Salt Air	93	50	75.1	0.18	
Scipio	94	29	68.4	0.51	
Snowville	98	33	67.6	0.17	
Soldier Summit	90[f]	22[f]	56.4[f]	1.15	
Terrace	100	36	70.6	0.20	
Thistle	102	30	71.2	0.46	
Tooele	93	42	71.4	0.55	
Tropic	91	46	66.6	2.69	
Utah Lake	.....	.....	.....	0.84	
Wellington	98	31	68.9	1.12	
Woodruff	92[e]	23[e]	61.9[e]	1.91	
Vermont.					
Burlington	84	48	66.7	2.56	
Cavendish	85	38	64.0	3.90	
Chelsea	82	36	61.2	4.76	
Chittenden	.....	.....	.....	4.93	
Cornwall	87[h]	43[h]	65.6[h]	1.95	
Derby	80	41	62.6	5.42	
Enosburg Falls	84	34	62.6	4.22	
Jacksonville	87	37	62.4	5.09	
Manchester	83	38	64.2	4.70	
Morrisville	86	33	63.7	4.19	
Norwich	87	35	63.0	3.69	
St. Johnsbury	88	38	64.5	4.39	
Wells	82	40	64.4	3.48	
Woodstock	90	37	63.4	4.56	
Virginia.					
Ashland	95	52	74.0	3.94	
Barboursville	89	54	72.4	5.10	
Bedford	.....	50	.....	0.98	
Bigstone Gap	86	53	71.8	2.72	
Blacksburg	86	45	69.2	4.00	
Buchanan	.....	.....	.....	3.44	
Burkes Garden	81	38	64.5	3.48	
Callaville	93	53	76.0	9.27	
Charlottesville	94	52	73.6	2.91	
Clarksville	.....	.....	.....	3.37	
Columbia	90	52	72.5	2.24	
Dale Enterprise	91	44	68.2	5.02	
Danville	.....	.....	.....	5.18	
Elk Knob	84	57	72.4	3.07	
Farmville	92	52	74.6	2.70	
Fredericksburg	92	51	72.9	3.73	
Grahams Forge	85	47	69.0	1.81	
Hampton	92	64	76.8	3.47	
Hot Springs	84	41	68.0	3.01	
Ivanhoe	.....	.....	.....	1.68	
Lexington	93	49	72.8	2.67	
Lincoln	95	45	70.9	3.07	
Marion	.....	48[d]	.....	5.40	
McDowell	90	38	69.4	1.73	
Mendota	.....	.....	.....	4.29	
Newport News	91	62	76.8	3.67	
Petersburg	92	56	75.0	3.20	
Radford	.....	.....	.....	2.14	
Riverton	.....	.....	.....	1.80	
Roanoke	95	50	74.0	2.62	
Rockymount	80	51	67.6	4.31	
Saxe	93	51	74.6	6.09	
Shenandoah	.....	.....	.....	3.34	
Speers Ferry	.....	.....	.....	3.24	
Spottsville	94	51	74.9	5.22	
Staunton	90	47	72.2	1.87	
Stephens City	96	44	72.4	0.53	
Warsaw	93	55	75.2	3.68	
Wilkerson	94	54	75.0	0.97	
Woodstock	95	45	73.1	2.50	
Wytheville	90	44	71.4	2.27	
Washington.					
Aberdeen	82	42	60.0	0.17	
Anacortes	.....	.....	.....	0.83	
Bellingham	79	40	59.2	0.73	
Blaine	79	41	57.9	0.52	
Brinnon	87	45	62.9	0.19	
Cedonia	102	42	71.3	0.40	
Centralia	99	35	63.8	0.01	
Cheney	101	38	68.9	0.00	
Clearbrook	93	36	60.1	0.92	
Clearwater	87	40	59.8	T.	
Cle Elum	102	30	64.1	0.36	
Colfax	100	34	66.0	0.11	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Washington—Cont'd.	°	°	°	*Ins.*	*Ins.*
Colville	101	31	65.0	0.41	
Conconully	97	37	68.6	0.52	
Coupeville	87	43	60.8	1.13	
Crescent	101	35	67.2	0.54	
Cusick	99	30	63.8	0.22	
Danville	99	37	68.0	0.73	
Dayton	102	45	71.8	0.07	
East Sound	88[f]	36[f]	58.0[f]	0.48	
Ellensburg	96	36	66.3	0.28	
Ephrata	105	41	77.1	0.20	
Grandmound	98	36	63.4	0.03	
Horseheaven	.....	.....	.....	0.19	
Kennewick	112	43	76.4	0.00	
Lacenter	99	42	65.0	0.19	
Lakeside	102	52	75.3	0.51	
Lester	98	36	63.2	0.21	
Lind	105	43	74.4	0.14	
Loomis[d]	103	48	74.0	.....	
Mount Pleasant	94	41[h]	65.9[d]	0.22	
Moxee	103	36	69.8	0.10	
Northport	100	30	63.8	0.65	
Odessa	109	36	70.6	0.04	
Olga	76	45	59.8	0.49	
Olympia	99	40	63.4	0.43	
Pinehill	104	42	71.0	0.38	
Pomeroy	103	39	70.5	T.	
Port Townsend	85	45	59.4	0.70	
Pullman	101	41	70.4[i]	0.25	
Rattlesnake	96	42	70.4	T.	
Republic	100	33	65.0	0.69	
Ritzville	.....	.....	.....	0.00	
Ritzville (near)	.....	.....	.....	0.12	
Rosalia	98	37	67.6	T.	
Sedro	85	40	59.9	0.33	
Silvana	85	40	58.9	0.41	
Snohomish	86	46	62.2	0.16	
Snoqualmie	95	40	63.9	0.20	
South Ellensburg	100	34	68.6	0.25	
Sprague	.....	.....	.....	0.00	
Sunnyside	100	43	69.9	0.00	
Trinidad	109	55	80.4	0.00	
Twisp	104	41	70.0	0.55	
Union	89	40	62.3	0.41	
Vancouver	97	42	67.4	0.15	
Vashon	86	46	62.0	0.13	
Waterville	100	45	69.4	0.16	
Wenatchee (near)	99	44	70.8	0.06	
Wilbur	98	33	65.7	0.14	
Zindel	111	53	81.2	0.95	
West Virginia.					
Bancroft	92	48	73.6	5.06	
Bayard	88[c]	32[c]	65.1[c]	1.71	
Bens Run	95	48	73.0	0.72	
Berkeley Springs	90[c]	42[c]	70.1[c]	2.37	
Beverly	90	44	67.6	6.71	
Bluefield	85	47	69.7	0.36	
Burlington	94	38	69.0	2.22	
Cairo	90	44	69.7	1.17	
Central	92	41	69.9	1.69	
Charleston	89	53	74.4	3.45	
Creston	98	45	72.8	0.76	
Cuba	92	46	70.9	0.67	
Doane	89	46	72.2	3.64	
Elkhorn	87	48	69.4	2.63	
Fairmont	.....	.....	.....	2.51	
Glenville	94	46	73.8	2.32	
Grafton	91	44	69.9	3.45	
Green Sulphur Springs	89	44	68.8	3.46	
Harpers Ferry	.....	.....	.....	1.47	
Hinton	.....	.....	.....	4.87	
Huntington	96	50	73.4	3.00	
Leonard	81	55	72.2	3.74	
Lewisburg	87	43	69.6	2.65	
Lillydale	88	45	70.5	3.40	
Logan	90	52	72.8	5.21	
Lost Creek	91	39	69.6	1.91	
Mannington	91	45	69.6	4.36	
Martinsburg	95	45	71.5	1.65	
Moorefield	95	40	71.8	2.15	
Morgantown	89	47	70.2	2.18	
Moundsville	90	47	70.1	2.49	
New Cumberland	88	41	66.8	3.60	
New Martinsville	97	47	73.2	1.54	
Nuttallburg	93	50	70.3	3.25	
Parsons	89	40	67.4	1.23	
Philippi	91	42	69.8	2.79	
Pickens	84	43	67.1	4.16	
Point Pleasant	91	50	73.7	3.32	
Princeton	82	48	68.7	6.60	
Rowlesburg	.....	.....	.....	2.37	
Ryan	90	44	70.6	3.27	
Southside	90	48	72.5	2.72	
Terra Alta	91	39	67.4	2.93	
Uppertract	91	40	69.8	1.75	
Valley Fork	88[c]	46[c]	71.2[c]	2.41	
Wellsburg	86	46	67.2	2.15	
Weston *b*	91	44	77.2	2.08	
Wheeling *a*	.....	.....	.....	2.02	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
West Virginia—Cont'd.	°	°	°	*Ins.*	*Ins.*
Wheeling *b*	95	49	75.8	2.52	
Williamson	91	53	74.2	4.93	
Wisconsin.					
Amherst	85	34	64.0	2.23	
Antigo	84	39	63.0	3.74	
Appleton	84	42	65.7	1.08	
Appleton Marsh	88	28	62.7	1.81	
Ashland	.....	.....	.....	2.94	
Barron	90	34	63.6	5.51	
Beloit	91	45	67.9	3.74	
Berlin	89	39	65.2	1.95	
Brodhead	89	41	67.6	4.72	
Burnett	87	38	64.6	1.63	
Butternut	85	33	60.7	6.56	
Chilton	86	39	66.0	1.17	
Chippewa Falls	.....	.....	.....	0.35	
Citypoint	88	30	61.2	2.45	
Cranberry Exp. Station	90	26	59.6	1.78	
Darlington	91	33	65.4	3.79	
Dodgeville	90	34	67.6	3.10	
Downing	86	35	62.5	4.90	
Easton	89	33	65.5	1.66	
Eau Claire	93	40	67.2	2.76	
Florence	83	35	60.1	3.88	
Fond du Lac	89	36	66.0	1.36	
Grand Rapids	87	37	64.5	2.01	
Grand River Locks	.....	.....	.....	2.04	
Grantsburg	88	42	64.0	3.68	
Hancock	86	38	65.4	2.12	
Harvey	88	42	66.0	4.32	
Hayward	82	34	61.7	4.00	
Hillsboro	88[e]	33[e]	63.6[e]	1.85	
Koepenick	85	34	61.8	3.60	
Lancaster	89	43	66.6	3.02	
Madison	86	49	66.9	3.20	
Manitowoc	85	43	62.8	2.22	
Meadow Valley	90	31	63.2	1.54	
Medford	85	35	64.4	3.90	
Menasha	.....	.....	.....	0.59	
Minocqua	79	45	63.0	5.17	
Mount Horeb	92	36	66.2	4.69	
Neillsville	90	34	64.8	1.42	
New London	90	37	65.0	1.24	
Oconto	85	39	64.2	2.94	
Osceola	89	37	62.0	3.54	
Oshkosh	86	44	67.3	1.43	
Pine River	86	39	64.5	1.87	
Portage	87	43	66.2	1.23	
Port Washington	85	39	61.0	3.84	
Prairie du Chien *a*	95	45	68.5	3.23	
Prairie du Chien *b*	.....	.....	.....	3.28	
Prentice	87	31	62.8	4.43	
Racine	88	46	66.7	2.32	
Sheboygan	87	44	65.2	1.73	
Stanley	85	33	62.7	2.77	
Stevens Point	90	34	65.0	2.39	
Tomahawk	82	35	61.2	4.93	
Valley Junction	90	34	65.4	1.05	
Viroqua	87	37	64.0	3.79	
Washburn	89	40	65.0	2.55	
Watertown	88	38	65.0	2.18	
Waukesha	85	47	65.8	3.70	
Wausau	84	42	63.6	2.14	
Whitehall	90	33	65.6	3.46	
Wyoming.					
Afton	87	26	61.6	1.38	
Alcova	96	40	70.2	0.64	
Basin	98	40	72.0	0.32	
Bedford	86	22	59.0	1.57	
Border	89	23	60.4	0.24	
Buffalo	95[d]	30[d]	64.2[d]	0.50	
Cambria	90	42	69.6	0.77	
Daniel	80	17	55.0	0.69	
Embar	99	37	68.5	0.58	
Evanston	87	27	60.2	1.91	
Fort Laramie	100	34	71.8	0.13	
Four Bear	82	33	60.2	1.02	
Fort Washakie	91	35	66.8	1.70	
Freedom	88	19	58.2	1.92	
Griggs	92	31	65.9	0.32	
Hatton	.....	.....	.....	1.31	
Hyattville	98	42	70.7	.....	
Iron Mountain	87	31	62.9	1.40	
Kirtley	95	35	67.4	1.90	
Laramie	84	27	61.4	0.93	
Leo	86	32	63.6	0.19	
Little Medicine	82	29	59.7	0.83	
Lolabama Ranch	85	29	56.6	2.30	
Lusk	97	29[c]	66.5[c]	0.65	
Marquette	93	36	63.8	0.67	
Moore	89	34	64.8	1.71	
Moorcroft	95	36	69.0	0.83	
Phillips	94	39	67.6	3.19	
Pine Bluff	92	38	68.4	2.46	
Rock Springs	89	34	62.7	.....	
South Pass	87	28	58.4	0.10	
Thermopolis	99	32	62.8	0.17	
Wells	79	18	53.6	1.46	

TABLE II.—*Climatological record of voluntary and other cooperating observers. Late reports for July*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Wyoming—Cont'd.	°	°	°	*Ins.*	*Ins.*
Yellowstone Park (C. H.)	78	24[k]	55.0[f]	2.24	
Yellowstone Pk. (Foun'n)	83	22	55.0	1.75	
Yellowstone Pk. (Lake)	86	24	55.3	1.54	
Yellowstone Park (Norris)	83	......	......	2.70	T.
Yellowstone Pk. (U. Ba'n)	84	22	55.2	1.17	
Porto Rico.					
Adjuntas	90	54	72.6	8.94	
Aguirre	95	67	80.7	4.07	
Arecibo	87	61	74.2	4.43	
Bayamon	90	60	76.6	7.18	
Caguas	90	60	77.4	7.77	
Canovanas	88	73	79.8	10.23	
Cayey	98	69	84.2	3.98	
Cidra	90	59	74.9	20.01	
Coamo	92	68	80.4	0.94	
Fajardo	92	68	81.6	4.25	
Guanica	91	64	78.0	1.88	
Hacienda Josefa	....	......	......	4.69	
Humacao	89	74	82.7	13.35	
Isabela	89	69	79.1	2.93	
Juana Diaz	88	60	74.2	1.34	
La Carmelita	88	64	76.4	8.11	
La Isolina	90	66	77.6	8.36	
Lares	92	60	76.4	7.83	
Las Marias	93	65	78.3	15.10	
Manati	94	68	79.8	4.29	
Maunabo	94	69	81.8	10.48	
Mayaguez	95	64	78.8	12.08	
Rio Blanco	90[g]	65[g]	79.2[g]	14.75	
San Lorenzo	91	63	77.8	9.37	
San Salvador	88	63	75.3	8.20	
Santa Isabel	92	65	79.4	2.51	
Vieques	90	71	81.6	3.51	
Yauco	89	67	80.2	2.95	
Mexico.					
Leon de Aldamas	82	53	67.1	5.64	
New Brunswick.					
St. John	73	46	60.1	5.67	

Late reports for July, 1904.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Alaska.	°	°	°	*Ins.*	*Ins.*
Chestochena	89	41	60.4	....	
Coal Harbor	70	39	50.3	4.22	
Coldfoot	81	34	59.1	2.80	
Copper Center	82	32	52.7	1.80	
Fort Gibbon	80	50	65.3	1.95	
Fort Liscum	66	38	48.8	5.61	
Fort Yukon	82	40	61.7	1.67	
Kenai	65	27	49.7	2.44	
Ketchemstock	76	27	51.7	2.23	
Killisnoo	63	38	51.1	4.60	
Mine Harbor	65	37	47.6	3.79	
Nushagak	79	39	53.1	2.47	
Sunrise	70	34	51.2	1.05	
Teikhill	......	28	......	1.53	
Wood Island	69	42	52.4	1.36	
California.					
Drytown	103	48	73.3	0.00	
San Miguel Island	74	51	59.8	0.00	
Colorado.					
Rio Blanco	89	68	79.8	8.09	
Illinois.					
Effingham	89*	51*	72.5*	5.50	
Michigan.					
Bloomingdale	98	41	69.7	2.25	
New Hampshire.					
Littleton	90	43	66.2	3.13	
North Carolina.					
Brewers	97	49	73.0	5.18	
Ohio.					
New Bremen	......	......	......	2.94	
Oregon.					
Paisley *	98	40	68.2	....	
Washington.					
Waterville	98	41	67.4	T.	
Mexico.					
Coatzacoalcos	86	65	76.6	12.91	
Vera Cruz	90	66	79.5	19.82	
Nicaragua, C. A.					
Nandaine	89	74	80.7	10.69	

EXPLANATION OF SIGNS.

* Extremes of temperature from observed readings of dry thermometer.

A numeral following the name of a station indicates the hours of observation from which the mean temperature was obtained, thus:

[1] Mean of 7 a. m. + 2 p. m. + 9 p. m. + 9 p. m. ÷ 4.
[2] Mean of 8 a. m. + 8 p. m. ÷ 2.
[3] Mean of 7 a. m. + 7 p. m. ÷ 2.
[4] Mean of 6 a. m. + 6 p. m. ÷ 2.
[5] Mean of 7 a. m. + 2 p. m. ÷ 2.
[6] Mean of readings at various hours reduced to true daily mean by special tables.

The absence of a numeral indicates that the mean temperature has been obtained from daily readings of the maximum and minimum thermometers.

An italic letter following the name of a station, as "Livingston *a*," "Livingston *b*," indicates that two or more observers, as the case may be, are reporting from the same station. A small roman letter following the name of a station, or in figure columns, indicates the number of days missing from the record; for instance, "n" denotes 14 days missing.

No note is made of breaks in the continuity of temperature records when the same do not exceed two days. All known breaks of whatever duration, in the precipitation record receive appropriate notice.

CORRECTIONS.

February, 1904, Minnesota, Milan, make mean temperature 3.6° instead of 3.4°.

June, 1904, Colorado, Breckenridge, make precipitation 2.42 instead of 2.43.

July, 1904, Mississippi, Hernando, make precipitation 7.19 instead of 7.15.

Under late reports for June, 1904, page 344, Kansas, make Gates Center read Yates Center.

NOTE.—The following change has been made in name of station: Nebraska, Spragg changed to Duff and moved 2¼ miles east of Spragg.

TABLE III.—*Resultant winds from observations at 8 a. m. and 8 p. m., daily, during the month of August, 1904.*

Stations.	Component direction from— N.	S.	E.	W.	Resultant. Direction from—	Duration.
	Hours.	Hours.	Hours.	Hours.	°	Hours.
New England.						
Eastport, Me	14	30	4	29	s. 57 w.	30
Portland, Me	14	31	7	22	s. 42 w.	23
Concord, N. H. †	10	9	10	10	n.	1
Northfield, Vt	13	41	4	13	s. 18 w.	29
Boston, Mass	10	24	11	25	s. 45 w.	20
Nantucket, Mass	15	31	17	13	s. 45 e.	6
Block Island, R. I	13	29	12	24	s. 37 w.	20
Narragansett, R. I.*	2	15	9	11	s. 9 w.	13
New Haven, Conn	21	25	12	17	s. 51 w.	6
Middle Atlantic States.						
Albany, N. Y	18	33	7	13	s. 22 w.	16
Binghamton, N. Y. †	12	3	15	10	n. 29 e.	10
New York, N. Y	12	25	15	20	s. 21 w.	14
Harrisburg, Pa	16	18	18	19	s. 27 w.	2
Philadelphia, Pa	18	21	13	22	s. 72 w.	10
Scranton, Pa	22	25	10	22	s. 76 w.	12
Atlantic City, N. J	15	24	10	25	s. 59 w.	18
Cape May, N. J	17	27	16	15	s. 6 e.	10
Baltimore, Md	24	20	11	17	n. 56 w.	7
Washington, D. C	26	19	12	15	n. 23 w.	8
Cape Henry, Va. †	6	17	13	3	s. 42 e.	15
Lynchburg, Va	17	21	19	22	s. 37 w.	5
Norfolk, Va	17	27	20	13	s. 35 e.	12
Richmond, Va	19	25	16	19	s. 27 w.	7
Wytheville, Va	13	15	9	35	s. 86 w.	26
South Atlantic States.						
Asheville, N. C	22	24	17	16	s. 27 e.	2
Charlotte, N. C	16	20	18	21	s. 37 w.	5
Hatteras, N. C	15	25	10	31	s. 65 w.	23
Raleigh, N. C	14	23	15	25	s. 48 w.	14
Wilmington, N. C	12	24	10	32	s. 61 w.	25
Charleston, S. C	11	27	10	26	s. 45 w.	23
Columbia, S. C	13	25	19	20	s. 5 w.	12
Augusta, Ga	13	30	21	12	s. 28 e.	19
Savannah, Ga	10	27	10	26	s. 43 w.	23
Jacksonville, Fla	11	32	16	17	s. 3 w.	21
Florida Peninsula.						
Jupiter, Fla	7	35	22	10	s. 23 e.	30
Key West, Fla	7	9	51	2	s. 88 e.	49
Sand Key, Fla. †	1	8	25	1	s. 74 e.	25
Tampa, Fla	13	17	40	6	s. 83 e.	34
Eastern Gulf States.						
Atlanta, Ga	16	21	19	21	s. 22 w.	5
Macon, Ga. †	10	11	4	11	s. 82 w.	7
Pensacola, Fla. †	13	6	9	10	n. 8 w.	7
Birmingham, Ala. †	6	11	11	10	s. 11 e.	5
Mobile, Ala	20	21	12	19	s. 82 w.	7
Montgomery, Ala	13	31	19	14	s. 16 e.	19
Meridian, Miss. †	9	7	11	13	s. 45 w.	3
Vicksburg, Miss	11	23	21	18	s. 14 e.	12
New Orleans, La	16	23	13	25	s. 6 w.	14
Western Gulf States.						
Shreveport, La	11	30	25	14	s. 30 e.	22
Fort Smith, Ark	10	13	42	7	s. 85 e.	35
Little Rock, Ark	15	27	18	18	s.	12
Corpus Christi, Tex	1	41	36	2	s. 42 e.	52
Fort Worth, Tex	5	38	23	6	s. 28 e.	37
Galveston, Tex	6	40	16	11	s. 8 e.	34
Palestine, Tex	6	39	20	8	s. 20 e.	35
San Antonio, Tex	6	33	39	1	s. 54 e.	47
Taylor, Tex. †	3	20	12	1	s. 33 e.	20
Ohio Valley and Tennessee.						
Chattanooga, Tenn	15	21	9	28	s. 72 w.	20
Knoxville, Tenn	17	25	15	22	s. 41 w.	11
Memphis, Tenn	19	25	10	19	s. 56 w.	11
Nashville, Tenn	22	17	11	25	n. 70 w.	15
Lexington, Ky. †	5	16	9	10	s. 5 w.	11
Louisville, Ky	25	19	6	23	n. 71 w.	18
Evansville, Ind. †	13	8	3	14	n. 66 w.	12
Indianapolis, Ind	22	20	14	22	n. 76 w.	8
Cincinnati, Ohio	22	15	23	19	n. 30 e.	8
Columbus, Ohio	21	21	21	14	e.	7
Pittsburg, Pa	29	15	12	23	n. 38 w.	18
Parkersburg, W. Va	22	25	14	15	s. 18 w.	3
Elkins, W. Va	19	12	4	38	n. 76 w.	30
Lower Lake Region.						
Buffalo, N. Y	16	26	15	21	s. 31 w.	12
Oswego, N. Y	14	24	11	24	s. 52 w.	16
Rochester, N. Y	15	18	9	35	s. 83 w.	26
Syracuse, N. Y	11	28	7	28	s. 51 w.	27
Erie, Pa	10	28	17	16	s. 3 e.	18
Cleveland, Ohio	17	25	22	14	s. 45 e.	11
Sandusky, Ohio †	8	14	8	12	s. 34 w.	7
Toledo, Ohio	13	20	15	26	s. 58 w.	13
Detroit, Mich	20	21	11	26	s. 86 w.	15
Upper Lake Region.						
Alpena, Mich	20	21	11	28	s. 87 w.	17
Escanaba, Mich	22	20	8	23	n. 82 w.	15
Grand Rapids, Mich	18	23	14	22	s. 58 w.	9
Houghton, Mich. †	7	5	11	15	n. 63 w.	4
Marquette, Mich	15	22	9	29	s. 71 w.	21
Port Huron, Mich	20	24	14	20	s. 56 w.	7
Sault Ste. Marie, Mich	17	13	15	32	n. 77 w.	18
Chicago, Ill	16	22	18	22	s. 34 w.	7
Milwaukee, Wis	18	20	13	24	s. 80 w.	11
Green Bay, Wis	13	27	14	22	s. 30 w.	16
Duluth, Minn	21	11	16	30	n. 54 w.	17
North Dakota.						
Moorhead, Minn	24	20	20	15	n. 51 e.	6
Bismarck, N. Dak	24	14	21	16	n. 27 e.	11
Williston, N. Dak	24	15	25	13	n. 55 e.	15

Stations.	Component direction from— N.	S.	E.	W.	Resultant. Direction from—	Duration.
	Hours.	Hours.	Hours.	Hours.	°	Hours.
Upper Mississippi Valley.						
Minneapolis, Minn.*	6	13	8	10	s. 16 w.	7
St. Paul, Minn	14	22	15	25	s. 51 w.	13
La Crosse, Wis. †	8	17	3	5	s. 13 w.	9
Davenport, Iowa	19	24	14	20	s. 50 w.	8
Des Moines, Iowa	15	23	15	22	s. 41 w.	11
Dubuque, Iowa	21	22	12	23	s. 85 w.	11
Keokuk, Iowa	20	21	18	21	s. 72 w.	3
Cairo, Ill	26	19	13	15	n. 16 w.	7
Springfield, Ill	17	23	18	18	s.	6
Hannibal, Mo. †	9	8	12	9	n. 72 e.	3
St. Louis, Mo	14	21	21	13	s. 49 e.	11
Missouri Valley.						
Columbia, Mo.*	8	11	8	12	s. 53 w.	5
Kansas City, Mo	17	29	24	9	s. 51 e.	19
Springfield, Mo	11	31	23	11	s. 31 e.	23
Topeka, Kans.*	8	15	7	5	s. 16 e.	7
Lincoln, Nebr	14	32	17	11	s. 18 e.	19
Omaha, Nebr	17	27	16	10	s. 31 e.	12
Valentine, Nebr	13	28	17	16	s. 4 e.	15
Sioux City, Iowa †	9	12	10	7	s. 45 e.	4
Pierre, S. Dak	21	20	27	10	n. 87 e.	17
Huron, S. Dak	20	23	25	8	s. 80 e.	17
Yankton, S. Dak. †	6	13	11	9	s. 16 e.	7
Northern Slope.						
Havre, Mont	24	11	17	24	n. 28 w.	15
Miles City, Mont	20	12	17	24	n. 41 w.	11
Helena, Mont	16	19	9	34	s. 83 w.	25
Kalispell, Mont	9	12	16	36	s. 81 w.	20
Rapid City, S. Dak	16	17	19	26	s. 82 w.	7
Cheyenne, Wyo	20	19	13	27	n. 86 w.	14
Lander, Wyo	19	20	9	24	s. 86 w.	15
Yellowstone Park, Wyo	8	33	1	34	s. 52 w.	41
North Platte, Nebr	8	34	17	14	s. 7 e.	26
Middle Slope.						
Denver, Colo	20	26	6	20	s. 67 w.	15
Pueblo, Colo	21	14	21	23	n. 16 w.	7
Concordia, Kans	10	37	21	9	s. 24 e.	30
Dodge, Kans	11	35	22	5	s. 33 e.	32
Wichita, Kans	11	32	25	5	s. 44 e.	29
Oklahoma, Okla	8	36	23	7	s. 30 e.	32
Southern Slope.						
Abilene, Tex	10	32	27	11	s. 36 e.	27
Amarillo, Tex	9	38	22	7	s. 28 e.	33
Southern Plateau.						
El Paso, Tex	12	13	42	9	s. 88 e.	33
Santa Fe, N. Mex	18	19	29	11	s. 87 e.	18
Flagstaff, Ariz	26	15	11	25	n. 52 w.	18
Phoenix, Ariz	10	15	23	24	s. 11 w.	5
Yuma, Ariz	9	28	19	23	s. 12 w.	19
Independence, Cal	19	20	16	24	s. 83 w.	8
Middle Plateau.						
Carson City, Nev	6	23	5	35	s. 60 w.	34
Winnemucca, Nev	19	20	16	25	s. 84 w.	9
Modena, Utah	11	12	10	40	s. 88 w.	30
Salt Lake City, Utah	24	15	19	18	n. 6 e.	9
Grand Junction, Colo	13	23	33	9	s. 67 e.	26
Northern Plateau.						
Baker City, Oreg	23	25	16	17	s. 27 w.	2
Boise, Idaho	17	16	12	32	n. 87 w.	20
Lewiston, Idaho †	1	6	25	2	s. 78 e.	24
Pocatello, Idaho	5	20	30	16	s. 43 e.	20
Spokane, Wash	14	23	15	23	s. 42 w.	12
Walla Walla, Wash	8	35	12	17	s. 10 w.	28
North Pacific Coast Region.						
North Head, Wash	38	11	5	28	n. 40 w.	36
Port Crescent, Wash.*	11	0	0	26	n. 67 w.	28
Seattle, Wash	22	18	8	29	n. 79 w.	21
Tacoma, Wash	39	6	4	15	n. 18 w.	35
Tatoosh Island, Wash	7	30	8	32	s. 46 w.	33
Portland, Oreg	36	6	2	35	n. 48 w.	45
Roseburg, Oreg	38	3	18	17	n. 2 e.	35
Middle Pacific Coast Region.						
Eureka, Cal	23	16	5	30	n. 74 w.	26
Mount Tamalpais, Cal	29	5	1	46	n. 62 w.	51
Red Bluff, Cal	15	32	25	9	s. 43 e.	23
Sacramento, Cal	3	51	15	4	s. 13 e.	49
San Francisco, Cal	0	12	0	56	s. 78 w.	57
Point Reyes Light, Cal.*	19	2	0	22	n. 52 w.	28
Southeast Farallon, Cal.*	20	0	0	22	n. 48 w.	30
South Pacific Coast Region.						
Fresno, Cal	43	0	1	40	n. 43 w.	58
Los Angeles, Cal	4	17	4	45	s. 73 w.	43
San Diego, Cal	18	13	3	41	n. 83 w.	38
San Luis Obispo, Cal	30	8	5	32	n. 51 w.	35
West Indies						
Basseterre, St. Kitts, W. I	18	3	53	0	n. 74 e.	55
Bridgetown, Barbados	15	6	51	1	n. 80 e.	51
Cienfuegos, Cuba	34	2	42	2	n. 51 e.	51
Colon, Panama, S. A. †	10	10	11	5	e.	6
Curaçoa, W. I	0	5	60	0	s. 85 e.	60
Grand Turk, W. I. †	3	1	28	0	n. 86 e.	28
Hamilton, Bermuda	9	19	10	35	s. 68 w.	27
Havana, Cuba †	0	0	31	0	e.	31
Kingston, Jamaica	21	2	7	8	n. 3 w.	19
Port of Spain, Trinidad †	2	10	23	3	s. 68 e.	22
Puerto Principe, Cuba	21	4	50	1	n. 71 e.	52
Roseau, Dominica, W. I. †	7	6	19	4	n. 86 e.	15
San Juan, Porto Rico	2	7	54	2	s. 85 e.	52
Santiago de Cuba, Cuba	48	4	18	6	n. 15 e.	46
Santo Domingo, Santo Domingo	61	0	2	0	n. 2 e.	61

* From observations at 8 p. m. only. † From observations at 8 a. m. only.

TABLE IV.—*Thunderstorms and auroras, August, 1904.*

States.	No. of stations.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total. No.	Total. Days.	
Alabama	60	T.	10	9	8	10	15	10	8	5	7	12	11	7	5	5	10	2	4	10	5	3	5	5	6	9	11	19	5	1		1	3	221	30	T.
		A.																																0	0	A.
Arizona	56	T.	5	9	10	6	10	11	3	7	9	10	8	7	13	7	8	12	12	8	6	5	10	15	5	10	6	7	12	7	15	9	3	265	31	T.
		A.																																0	0	A.
Arkansas	57	T.	10	4	11	10	10	9	5	2	1	3	4			2	4	3	10	7	3	3		8		3	8	8						128	22	T.
		A.																																0	0	A.
California	167	T.	7	4	2	6	4	3	5	5	3	1		4	8	6	8	11	3	1	1	1	2	11	25	15	7	4	5	4	1			157	28	T.
		A.																																0	0	A.
Colorado	70	T.	8	5	5	11	7	3	14	13	2	5	11	10	17	16	17	17	10	10	6	6	7		1	2	8	7	12	10	9	10	11	270	30	T.
		A.																																0	0	A.
Connecticut	21	T.	12	14	1	3	1	3	1	13		5	2			2		4	2	3		4	2	2	2									86	18	T.
		A.																																0	0	A.
Delaware	5	T.	1	2			1					5						2				1		5										17	7	T.
		A.																																0	0	A.
Dist. of Columbia	4	T.	1				1					1						1				1		1										6	6	T.
		A.																																0	0	A.
Florida	61	T.	11	14	12	12	12	9	11	15	13	12	3	9	17	11	11	14	13	12	6	3	8	9	4	11	11	10	13	9	8	11	9	323	31	T.
		A.																																0	0	A.
Georgia	67	T.	12	17	11	12	16	17	7	9	8	13	6	9	10	12	19	4	7	10	10	6	5	4	13	12	4	18	8				1	280	29	T.
		A.																																0	0	A.
Idaho	34	T.			1		1		3		2	4	5	3	1	6	7	2	1	2	2	1		1	1	2		4	7	12	5	4	1	78	24	T.
		A.																																0	0	A.
Illinois	84	T.	7	1		33	2				11	22	1		20	12	10	4	10	15	20	9	26	8		1	10			1	1	1	4	219	23	T.
		A.																		1														1	1	A.
Indiana	58	T.	4								1	14			8	7	1	1	3	6	14	10	9	4			15	2					3	102	16	T.
		A.																																0	0	A.
Indian Territory	20	T.	6	2		8	5	2	2	2							1	3	3	1	2	2												39	13	T.
		A.																																0	0	A.
Iowa	128	T.	1	1	10	20		2	1	2	47	1		1	10	5	25		20	8	10	7	36	1			4			21	15		3	251	23	T.
		A.																																0	0	A.
Kansas	88	T.	5	1	3	6	2	3	4	5	7	1		1	3	3	4	6	2	6	4	1	7	2			6	1		2	4	5	2	96	27	T.
		A.																																0	0	A.
Kentucky	41	T.	11	2		1	9	1			1	4			3	9	3	1		2	3	4	6	1	1	2	7		1					72	20	T.
		A.																																0	0	A.
Louisiana	46	T.	7	9	10	3	8	8	5	5	5	4	4	2				1	3		1	3	1	1	2	3	4	6	5		2	3	7	112	26	T.
		A.																																0	0	A.
Maine	25	T.	5	1	1	1	2	6	2	6			10			1	2		2			2								1	1			43	15	T.
		A.			4																													4	1	A.
Maryland	42	T.	11	16		4	9	2	1	2	2	10						11	9	3	3	8	1	18		1								111	17	T.
		A.															1																	1	1	A.
Massachusetts	48	T.	16	26				12	1	19	1		1	1		2		7	1	1		9	1											98	14	T.
		A.																																0	0	A.
Michigan	106	T.				11	4	1			3	21		6	9		14	11	8		5	3	20	10		7	13		1		1			148	18	T.
		A.	1																2															3	2	A.
Minnesota	67	T.	2	1	13	1		3	3	5	18		6	12				4	8		17	23	13			5	2			11	2	2	11	162	21	T.
		A.																																0	0	A.
Mississippi	57	T.	7	10	9	8	10	6	4	4	6	4	6	5	2	1	6	5	5	6		5	2	3	3	7	10	9	2	1	1	3	5	155	30	T.
		A.																																0	0	A.
Missouri	86	T.	22			19		1	7	15	21	8	9	8	18	14	21	2	15	25	28	11	25	11	1	1	13			5	3	5	6	314	26	T.
		A.																																0	0	A.
Montana	54	T.					1	3	7	3		4	4	2	1	2	3	1	3	1	2	9				2			4	10	9	14	12	97	21	T.
		A.																																0	0	A.
Nebraska	137	T.		15	36	19	23	22	17	10	31		4		3	1	33	8	12	27	12	11	28				1		5	23	20	2	18	381	24	T.
		A.																																0	0	A.
Nevada	40	T.	4	5	5	6	7	4	6	4	7	6	5	7	7	5	5	8	3	3		1	1	5	2	7	10	10	9	2				144	27	T.
		A.																																0	0	A.
New Hampshire	21	T.	4	5	2			3	1	9		2	3			2	1		2	2		4						1						41	14	T.
		A.																																0	0	A.
New Jersey	48	T.	19	16		2	7	1		8		19	9		14	1		4	1		2	14	4	15	2									138	17	T.
		A.																																0	0	A.
New Mexico	31	T.	3	3	1	1	4	2	4	2	2	1				3	2	4	3	3		3	5			1	2			1	2	3	3	58	23	T.
		A.																																0	0	A.
New York	129	T.	12	29	5	1	20	13	6	13	2	10	3	2	8	17		12	27	6	1	11	2	40	1	1	18	8						268	25	T.
		A.																																0	0	A.
North Carolina	56	T.	12	11	5	11	16	11	9	4	14	4	13	9		6	14	5	5	1	15	3	8	4	13	2	2	11	2	3			2	215	27	T.
		A.																																0	0	A.
North Dakota	48	T.			5	1	1			7	1	1	3	3				2	3	8	12	6				2					1	5	3	64	17	T.
		A.	1								1								1													1		4	4	A.
Ohio	101	T.	22	4			1	6	1		20	4	3		30	12	1	34	26	3	5	6	15	13		1	49	8					2	266	22	T.
		A.																																0	0	A.
Oklahoma	36	T.	1	6	1	4	3	3	1		4		1					2	4	6	4	2	3	1	1			1						48	18	T.
		A.																																0	0	A.
Oregon	70	T.	5	7	2		3				1			1	2	2	1	1	1	1				1	1	3	14	9	22	15	1			93	20	T.
		A.																																0	0	A.
Pennsylvania	91	T.	14	21	2	1	17	4	1	5		14	3	1	8	19		17	21	3		8	5	28	2	1	11	4						210	23	T.
		A.																																0	0	A.
Rhode Island	6	T.		4	1		1	5		6						2		2																21	7	T.
		A.																																0	0	A.
South Carolina	54	T.	10	16	10	13	17	11	10	9	15	11	11	9	2	4	19	3	7	7	12	2	1	4	16	2	2	16	8	3			1	251	29	T.
		A.																																0	0	A.
South Dakota	56	T.		4	3					16	3	2	4	4	6	2	8	4	9	15	11	7	13	2			1			7	1	4	22	148	22	T.
		A.																																0	0	A.
Tennessee	56	T.	15	4	2	8	8	7	7	1	1	8	5	6	6	12	9	5	4	2	7	8	6	9	8		6	3					1	158	26	T.
		A.																																0	0	A.
Texas	126	T.	14	13	4	8		3	3	2	4	3	8	6		4	2	2	5	2	4	1		9		4	1	6	5				2	115	24	T.
		A.																																0	0	A.
Utah	64	T.	3	6	4	1	2		7	13	7	13	21	22	14	19	14	18	17	6	6	7	3	2	3	7	11	15	15	4	9	3	5	277	30	T.
		A.																																0	0	A.
Vermont	12	T.	3	3	2		1	1	1	1			3			3			4		1			2				1	1					27	14	T.
		A.											1																					1	1	A.
Virginia	40	T.	12	13	1	11	15	1	5	4	7	8	7		2	5	5	12	1	6	5	6	3	15										144	21	T.
		A.																																0	0	A.
Washington	71	T.																																0	0	T.
		A.																								1	3	5	13					22	4	A.
West Virginia	47	T.	11	4		3	10	4	1			1			2	13		13	3	2	3	9	1	7	1		1	4						93	19	T.
		A.																																0	0	A.
Wisconsin	63	T.			6	22		2	1		13	3	3	9	16	1	18	2		2	4	7	26			3	2		1	8	2			151	21	T.
		A.																																0	0	A.
Wyoming	38	T.	3	1		5	1	3	3	2	1	6	5	3	3	8	8	10	8	5	2	3						4	6	5	3	7	3	108	25	T.
		A.																																		A.
Sums	2993	T.	348	338	204	302	287	221	178	253	301	280	205	169	268	264	314	297	320	247	254	259	310	277	114	127	271	199	154	179	116	92	143	7,291	....	T.
		A.	2		4						1		1				1		3	1												1		14	....	A.

TABLE V.—*Accumulated amounts of precipitation for each 5 minutes, for storms in which the rate of fall equaled or exceeded 0.25 in any 5 minutes, or 0.75 in 1 hour during August, 1904, at all stations furnished with self-registering gages.*

Stations.	Date.	Total duration.		Total amount of precipitation.	Excessive rate.		Amount before excessive began.	Depths of precipitation (in inches) during periods of time indicated.													
		From—	To—		Began—	Ended—		5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.
	1	2	3	4	5	6	7														
Albany, N. Y.	22			0.49						0.27											
Alpena, Mich.	21			0.47							0.46										
Amarillo, Tex.	17	2:15 p. m.	8:45 p. m.	1.67	3:53 p. m.	4:38 p. m.	0.03	0.07	0.15	0.28	0.50	0.81	0.93	0.94	1.07	1.30					
Do	21	8:25 p. m.	9:00 p. m.	0.70	8:29 p. m.	8:39 p. m.	T.	0.21	0.69												
Asheville, N. C.	4			0.68														0.64			
Atlanta, Ga.	15	11:36 a. m.	1:40 p. m.	1.14	11:41 a. m.	12:00 m.	0.01	0.20	0.37	0.73	0.87	0.90	0.93	0.98							
Do	26	3:54 p. m.	9:00 p. m.	2.08	3:59 p. m.	4:55 p. m.	0.04	0.12	0.16	0.32	0.54	0.82	1.11	1.32	1.42	1.53	1.61	1.70			
Atlantic City, N. J.	20	7:20 p. m.	8:03 p. m.	1.03	7:27 p. m.	7:55 p. m.	T.	0.27	0.32	0.42	0.56	0.83	1.02								
Augusta, Ga.	11	3:20 p. m.	4:45 p. m.	1.00	3:29 p. m.	3:50 p. m.	T.	0.19	0.59	0.74	0.84	0.88	0.91								
Baltimore, Md.	22	4:35 p. m.	5:55 p. m.	0.50	4:35 p. m.	4:48 p. m.	0.00	0.08	0.41	0.47	0.49										
Binghamton, N. Y.	17			0.60						0.49											
Birmingham, Ala.	26			0.40					0.32												
Bismarck, N. Dak.	21			0.19														0.17			
Block Island, R. I.	2	8:05 a. m.	6:30 p. m.	2.53	10:06 a. m.	10:34 a. m.	0.09	0.09	0.14	0.25	0.40	0.45	0.51								
					11:04 a. m.	11:21 a. m.	0.66	0.10	0.36	0.48	0.53										
					12:40 p. m.	1:18 p. m.	1.28	0.12	0.28	0.45	0.53	0.62	0.70	0.81							
Do	6	2:00 a. m.	4:30 a. m.	1.14	3:35 a. m.	4:14 a. m.	0.39	0.15	0.26	0.32	0.46	0.52	0.60	0.63	0.72						
Do	6	9:45 a. m.	10:49 a. m.	0.67	10:25 a. m.	10:44 a. m.	0.16	0.08	0.22	0.42	0.51										
Boise, Idaho.	28			0.18														*			
Boston, Mass.	2	5:20 a. m.	8:20 a. m.	0.54	5:23 a. m.	5:38 a. m.	T.	0.14	0.36	0.38											
Buffalo, N. Y.	13			1.01														0.47			
Cairo, Ill.	20	D. N.	7:35 a. m.	1.03	3:54 a. m.	4:19 a. m.	0.25	0.06	0.21	0.47	0.63	0.73									
Cape Henry, Va.	2	7:04 p. m.	11:40 p. m.	1.65	8:35 p. m.	9:00 p. m.	0.41	0.06	0.26	0.67	0.83	0.88									
Do	11	12:03 p. m.	1:55 p. m.	0.82	1:17 p. m.	1:36 p. m.	0.09	0.33	0.41	0.59	0.72										
Charleston, S. C.	4	8:49 a. m.	2:23 p. m.	1.47	9:38 a. m.	10:05 a. m.	0.41	0.08	0.30	0.43	0.54	0.66	0.72								
Do	27	12:26 p. m.	10:05 p. m.	1.70	12:58 p. m.	1:23 p. m.	0.06	0.15	0.19	0.19	0.46	0.73									
Charlotte, N. C.	2	1:05 p. m.	5:00 p. m.	1.69	2:14 p. m.	2:39 p. m.	0.01	0.16	0.39	0.60	0.88	1.09									
Do	5	3:17 p. m.	4:55 p. m.	1.06	3:18 p. m.	4:03 p. m.	0.01	0.07	0.18	0.49	0.58	0.39	0.61	0.77	0.93	1.01					
Do	11	2:25 p. m.	6:20 p. m.	1.79	2:26 p. m.	3:11 p. m.	T.	0.05	0.16	0.30	0.56	0.83	1.12	1.35	1.54	1.59					
Chattanooga, Tenn.	1-2	9:15 p. m.	4:15 a. m.	2.91	10:37 p. m.	11:02 p. m.	0.04	0.22	0.54	0.89	1.10	1.27	1.29								
					11:47 p. m.	12:42 a. m.	1.86	0.18	0.33	0.40	0.46	0.50	0.53	0.61	0.77	0.96	1.10	1.27			
Chicago, Ill.	21-22			1.83														*			
Cincinnati, Ohio.	19			0.12									0.12								
Cleveland, Ohio.	10			0.50						0.40											
Columbia, Mo.	18-19	10:00 p. m.	9:30 a. m.	2.86	4:40 a. m.	5:35 a. m.	0.57	0.09	0.19	0.41	0.47	0.51	0.66	0.75	0.78	0.88	0.97	1.06			
					6:15 a. m.	7:30 a. m.	1.84	0.08	0.16	0.27	0.34	0.40	0.46	0.52	0.56	0.66	0.70	0.81	1.00		
Columbia, S. C.	6	5:47 p. m.	6:43 p. m.	1.16	5:52 p. m.	6:25 p. m.	0.01	0.10	0.19	0.50	0.83	1.03	1.11								
Do	19	4:06 p. m.	5:50 p. m.	1.47	4:40 p. m.	4:55 p. m.	0.11	0.50	0.99	1.26	1.28	1.31									
Columbus, Ohio.	25	4:40 p. m.	6:45 p. m.	0.98	5:06 p. m.	5:40 p. m.	0.01	0.15	0.29	0.47	0.60	0.66	0.75	0.84	0.87						
Concord, N. H.	20	5:15 a. m.	8:15 p. m.	1.92	6:03 p. m.	6:27 p. m.	1.04	0.08	0.22	0.29	0.53	0.69									
Corpus Christi, Tex.	24			0.40														0.40			
Davenport, Iowa.	13	8:20 a. m.	9:20 a. m.	0.70	8:39 a. m.	8:55 a. m.	T.	0.12	0.47	0.57	0.60	0.66									
Denver, Colo.	27			0.28														0.26			
Des Moines, Iowa.	28	8:45 p. m.	9:45 p. m.	0.59	9:09 p. m.	9:25 p. m.	0.02	0.33	0.44	0.52	0.55										
Detroit, Mich.	19-20			2.07														0.51			
Dodge, Kans.	18	4:57 p. m.	6:25 p. m.	1.74	5:12 p. m.	5:57 p. m.	0.06	0.11	0.18	0.33	0.46	0.63	0.86	1.22	1.54	1.66					
Dubuque, Iowa.	28-29			1.04														0.50			
Duluth, Minn.	19	7:46 p. m.	10:15 p. m.	0.90	7:50 p. m.	8:04 p. m.	0.02	0.17	0.57	0.64											
Eastport, Me.	15	9:03 a. m.	9:45 a. m.	0.84	9:06 a. m.	9:24 a. m.	0.01	0.24	0.58	0.77	0.81										
Elkins, W. Va.	14	1:40 a. m.	3:00 a. m.	0.63	1:43 a. m.	1:57 a. m.	T.	0.35	0.51	0.58											
Do	16	1:35 p. m.	2:20 p. m.	0.77	1:53 p. m.	2:10 p. m.	0.01	0.12	0.48	0.73	0.75										
Do	20	3:32 p. m.	9:20 p. m.	1.30	3:53 p. m.	4:10 p. m.	0.06	0.25	0.42	0.56	0.59										
Erie, Pa.	25	2:38 p. m.	3:22 p. m.	0.49	2:39 p. m.	3:00 p. m.	T.	0.25	0.35	0.42	0.46										
Escanaba, Mich.	12-13			0.48														0.39			
Evansville, Ind.	19			0.58														0.36			
Fort Smith, Ark.	26	3:41 a. m.	4:37 a. m.	1.13	4:04 a. m.	4:27 a. m.	0.08	0.20	0.60	0.80	0.98	1.04									
Fort Worth, Tex.	2	2:18 p. m.	3:30 p. m.	0.82	2:23 p. m.	2:45 p. m.	0.01	0.26	0.51	0.64	0.75	0.78									
Galveston, Tex.	8-9	11:40 p. m.	10:45 a. m.	1.61	11:42 p. m.	12:05 a. m.	T.	0.18	0.35	0.51	0.68	0.75									
Grand Junction, Colo.	11			0.27														0.26			
Grand Rapids, Mich.	21			0.61							0.34										
Green Bay, Wis.	21			0.40									0.40								
Hannibal, Mo.	13	3:02 p. m.	5:05 p. m.	1.21	3:10 p. m.	3:35 p. m.	T.	0.13	0.35	0.82	1.00	1.16									
Do	15	3:00 a. m.	7:20 a. m.	1.65	5:28 a. m.	6:12 a. m.	0.12	0.07	0.19	0.25	0.29	0.39	0.47	0.63	0.77	0.91					
Do	19	4:36 p. m.	7:10 p. m.	1.00	5:29 p. m.	6:00 p. m.	0.11	0.09	0.21	0.42	0.62	0.71	0.78								
Do	21-22	8:06 p. m.	D. N.	1.01	8:48 p. m.	9:18 p. m.	0.02	0.18	0.28	0.38	0.57	0.70	0.73								
Harrisburg, Pa.	17			0.72														0.42			
Hatteras, N. C.	3	12:45 p. m.	11:50 p. m.	2.03	10:07 p. m.	10:52 p. m.	1.05	0.17	0.24	0.25	0.31	0.49	0.62	0.74	0.83	0.90					
Do	26	3:45 p. m.	9:30 p. m.	1.43	4:25 p. m.	5:05 p. m.	0.20	0.06	0.31	0.42	0.49	0.58	0.66	0.74	0.79	0.82	0.85				
Huron, S. Dak.	8	6:10 p. m.	7:15 p. m.	1.54	6:26 p. m.	7:05 p. m.	0.01	0.19	0.42	0.85	1.03	1.11	1.31	1.49	1.53						
Do	18	2:25 p. m.	9:15 p. m.	2.10	3:16 p. m.	4:16 p. m.	0.27	0.12	0.31	0.40	0.44	0.59	0.85	1.04	1.14	1.22	1.32	1.48			
Indianapolis, Ind.	31			0.51								0.47									
Jacksonville, Fla.	7			0.55					0.53												
Jupiter, Fla.	8	7:24 p. m.	9:10 p. m.	1.00	7:25 p. m.	8:25 p. m.	T.	0.07	0.18	0.25	0.32	0.34	0.50	0.61	0.66	0.71	0.81	0.95			
Kalispell, Mont.	30			0.32														0.26			
Kansas City, Mo.	19	D. N.	7:50 a. m.	1.95	12:51 a. m.	2:02 a. m.	0.03	0.10	0.21	0.26	0.30	0.33	0.40	0.56	0.67	0.75	0.86	1.20	1.34		
Do	21	5:10 p. m.	11:30 p. m.	2.30	5:22 p. m.	6:16 p. m.	0.02	0.11	0.16	0.41	0.74	0.93	1.07	1.25	1.35	1.50	1.64	1.77			
Key West, Fla.	9	10:30 a. m.	3:00 p. m.	0.70	10:40 a. m.	10:55 a. m.	T.	0.22	0.33	0.47	0.50										
Do	12	D. N.	8:50 a. m.	1.53	4:16 a. m.	4:35 a. m.	0.27	0.34	0.74	0.97	1.01	1.03									
Knoxville, Tenn.	14	3:15 p. m.	4:15 p. m.	0.74	3:41 p. m.	4:15 p. m.	0.06	0.05	0.15	0.25	0.34	0.49	0.62	0.68							
La Crosse, Wis.	15	7:15 a. m.	7:35 a. m.	0.67	7:18 a. m.	7:35 a. m.	T.	0.16	0.51	0.65	0.67										
Lewiston, Idaho.	27			0.16														0.09			
Lexington, Ky.	10			1.21														0.38			
Lincoln, Nebr.	9			0.75																	
Little Rock, Ark.	4	2:16 p. m.	3:22 p. m.	0.66	2:25 p. m.	2:47 p. m.	T.	0.14	0.29	0.44	0.60	0.65									
Los Angeles, Cal.	13			0.13					0.13												
Louisville, Ky.	10	7:10 a. m.	10:45 a. m.	1.25	7:39 a. m.	8:27 a. m.	0.10	0.18	0.22	0.29	0.37	0.43	0.49	0.54	0.65	0.70					
Lynchburg, Va.	1			0.70						0.42											
Macon, Ga.	3	12:15 a. m.	3:30 a. m.	1.05	12:24 a. m.	1:20 a. m.	0.01	0.05	0.16	0.29	0.35	0.43	0.52	0.57	0.61	0.66	0.71	0.82			
Do	9	7:30 p. m.	11:00 p. m.	1.46	7:35 p. m.	8:35 p. m.	0.01	0.08	0.20	0.25	0.30	0.35	0.41	0.41	0.51	0.80	1.01	1.24			
Do	26-27	7:35 p. m.	2:00 a. m.	1.28	9:52 p. m.	10:25 p. m.	0.36	0.09	0.24	0.43	0.56	0.62	0.67	0.71							
Memphis, Tenn.	15	8:15 p. m.	D. N.	1.24	8:23 p. m.	8:42 p. m.	0.01	0.19	0.44	0.73	0.82	0.84	0.86								
Meridian, Miss.	11	4:58 p. m.	9:30 p. m.	1.86	5:00 p. m.	5:45 p. m.	T.	0.11	0.50	0.81	1.04	1.21	1.31	1.41	1.52	1.59					
Milwaukee, Wis.	9-10			0.78																	
Minneapolis, Minn.	20	2:42 a. m.	D. N.	1.29	2:44 a. m.	3:19 a. m.	0.01	0.12	0.37	0.60	0.70	0.75	1.05	1.23	1.27						
Do	20	8:25 p. m.	10:30 p. m.	1.27	9:11 p. m.	9:56 p. m.	0.14	0.06	0.21	0.29	0.39	0.41	0.48	0.76	1.01	1.10					
Montgomery, Ala.	3	1:55 p. m.	2:35 p. m.	1.56	1:57 p. m.	2:15 p. m.	T.	0.48	1.03	1.47	1.53	1.56									
Do	12	1:44 p. m.	4:18 p. m.	1.22	1:46 p. m.	2:15 p. m.	T.	0.17	0.43	0.67	0.87	1.04	1.13								
Nantucket, Mass.	2			0.79														0.71			
Nashville, Tenn.	1	1:15 p. m.	2:30 p. m.	0.79	1:20 p. m.	1:47 p. m.	0.01	0.12	0.18	0.35	0.51	0.69	0.75								
Do	22	5:20 p. m.	6:12 p. m.	1.19	5:32 p. m.	6:07 p. m.	0.01	0.22	0.42	0.60	0.80	1.01	1.10	1.18							
New Haven, Conn.	10	6:00 a. m.	1:10 p. m.	1.73	10:34 a. m.	12:15 p. m.	0.08	0.07	0.12	0.21	0.32	0.55	0.67	0.71	0.75	0.77	0.80	0.91	1.15	1.47	

TABLE V.—*Accumulated amounts of precipitation for each 5 minutes, etc.*—Continued.

Stations.	Date.	Total duration. From—	Total duration. To—	Total amount of precipitation.	Excessive rate. Began—	Excessive rate. Ended—	Amount before excessive began.	5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.
	1	2	3	4	5	6	7														
New Haven, Conn.	20	12:30 a. m.	12:20 p. m.	3.11	7:50 a. m.	9:50 a. m.	0.77	0.07	0.15	0.23	0.47	0.58	0.69	0.79	0.86	0.93	1.09	1.28	1.46	1.74	1.98
New Orleans, La.	25	7:50 p. m.	10:45 p. m.	2.33	8:33 p. m.	9:20 p. m.	0.01	0.10	0.31	0.89	1.35	1.64	1.84	1.96	2.05	2.17					
New York, N. Y.	1	2:01 p. m.	3:30 p. m.	1.66	2:03 p. m.	2:53 p. m.	T.	0.10	0.29	0.61	0.81	1.05	1.15	1.26	1.40	1.56	1.64				
Do	10	2:50 p. m.	3:40 p. m.	0.68	2:50 p. m.	3:15 p. m.	0.00	0.16	0.32	0.48	0.56	0.68									
Do	19–20	10:08 p. m.	8:48 a. m.	2.76	5:15 a. m.	6:05 a. m.	0.56	0.12	0.23	0.33	0.38	0.44	0.48	0.54	0.58	0.61	0.63				
					6:05 a. m.	6:40 a. m.		0.68	0.75	1.16	1.42	1.49	1.62	1.72							
Norfolk, Va.	2			0.78														0.63			
Northfield, Vt.	11			0.29						0.26											
North Head, Wash	28–29			0.02																	
Oklahoma, Okla.	16			0.46								0.45									
Omaha, Nebr.	9	12:13 a. m.	5:20 a. m.	1.15	2:47 a. m.	3:17 a. m.	0.19	0.08	0.21	0.27	0.34	0.35	0.55	0.66	0.81	0.82					
Do	18–19	11:30 p. m.	6:00 a. m.	0.94	4:15 a. m.	4:52 a. m.	0.32	0.06	0.14	0.23	0.30	0.47	0.56	0.58	0.61						
Palestine, Tex.	6–7			1.11														0.25			
Parkersburg, W. Va.	25	7:50 p. m.	11:35 p. m.	0.96	7:55 p. m.	8:47 p. m.	0.01	0.05	0.13	0.19	0.23	0.24	0.27	0.38	0.43	0.46	0.57	0.76			
Pensacola, Fla.	7	12:05 a. m.	5:30 a. m.	2.11	2:04 a. m.	2:32 a. m.	0.23	0.15	0.47	0.73	1.04	1.40	1.45								
Do	25	12:08 a. m.	2:45 a. m.	1.33	12:12 a. m.	12:42 a. m.	0.02	0.21	0.46	0.71	0.95	1.11	1.18								
Do	30	10:45 a. m.	1:10 p. m.	1.53	11:13 a. m.	11:41 a. m.	0.06	0.18	0.51	0.79	1.02	1.15	1.24								
Philadelphia, Pa.	10–11	8:10 p. m.	D. N.	2.04	9:21 p. m.	9:49 p. m.	0.26	0.24	0.38	0.57	0.61	0.68	0.74								
					11:42 p. m.	12:02 a. m.	1.45	0.11	0.24	0.43	0.53										
Pittsburg, Pa.	16			0.57														0.36			
Pocatello, Idaho.	11			0.38														*			
Portland, Me.	20			2.21														0.43			
Portland, Oreg	28			0.19														0.07			
Pueblo, Colo	7	7:20 p. m.	11:40 p. m.	0.97	8:53 p. m.	9:15 p. m.	T.	0.19	0.51	0.65	0.74										
Raleigh, N. C	5	2:40 p. m.	3:40 p. m.	0.80	2:40 p. m.	3:15 p. m.	0.00	0.27	0.40	0.50	0.62	0.65	0.67	0.74							
Richmond, Va	19			0.85														0.59			
Rochester, N. Y.	19–20			1.34														0.35			
Sacramento, Cal.	23–24			0.07														0.05			
St. Louis, Mo	19	8:54 p. m.	10:30 p. m.	1.03	8:54 p. m.	9:12 p. m.	0.00	0.42	0.66	0.74	0.83	0.87									
St. Paul, Minn	20	2:58 a. m.	5:10 a. m.	0.70	2:58 a. m.	3:37 a. m.	0.00	0.11	0.20	0.36	0.43	0.50	0.60	0.65	0.70						
Do	20–21	9:15 p. m.	D. N.	1.34	9:15 p. m.	9:50 p. m.	0.00	0.05	0.12	0.19	0.29	0.41	0.47	0.51							
Salt Lake City, Utah	11			0.10							0.10										
San Antonio, Tex	7	5:20 a. m.	8:45 a. m.	1.31	6:15 a. m.	7:15 a. m.	0.10	0.09	0.22	0.43	0.51	0.56	0.64	0.66	0.71	0.73	0.79	0.98			
San Diego, Cal.	13			T.																	
Sandusky, Ohio	10			0.41					0.27												
San Francisco, Cal	23–24			0.06														0.03			
Savannah, Ga	3	10:12 a. m.	11:59 a. m.	0.84	11:03 a. m.	11:18 a. m.	0.05	0.27	0.63	0.77											
Do	22	2:35 p. m.	3:40 p. m.	1.05	2:40 p. m.	3:15 p. m.	0.01	0.08	0.20	0.30	0.52	0.75	0.92	1.01	1.04						
Scranton, Pa	22	5:08 p. m.	8:04 p. m.	0.61	5:37 p. m.	5:57 p. m.	T.	0.16	0.32	0.41	0.50										
Seattle, Wash	28–29			0.06														0.02			
Shreveport, La	12			0.50													0.50				
Spokane, Wash	28			0.15						0.13											
Springfield, Ill	21–22	9:52 p. m.	4:40 a. m.	1.45	10:01 p. m.	10:35 p. m.	0.01	0.16	0.38	0.63	0.68	0.73	0.82	0.90	0.94	0.97					
Springfield, Mo	1	6:41 p. m.	8:20 p. m.	0.96	6:41 p. m.	7:05 p. m.	0.00	0.15	0.44	0.69	0.83	0.90	0.93								
Syracuse, N. Y	17			0.67						0.43											
Tampa, Fla	2	4:05 a. m.	9:40 a. m.	1.48	4:09 a. m.	4:35 a. m.	0.03	0.06	0.21	0.40	0.52	0.60	0.62								
Do	9	5:25 p. m.	9:25 p. m.	1.06	5:36 p. m.	5:57 p. m.	0.01	0.24	0.45	0.56	0.62	0.64	0.66								
Do	28	12:25 p. m.	1:36 p. m.	0.74	12:27 p. m.	12:47 p. m.	0.01	0.30	0.40	0.60	0.72										
Taylor, Tex.	6–7	9:15 p. m.	4:20 a. m.	1.54	10:10 p. m.	10:34 p. m.	0.18	0.05	0.18	0.37	0.60	0.66									
Toledo, Ohio	25			0.48						0.48											
Topeka, Kans	21	4:10 p. m.	8:15 p. m.	0.99	4:19 p. m.	4:41 p. m.	T.	0.05	0.20	0.34	0.51	0.56	0.60	0.61	0.67	0.71					
Valentine, Nebr	2	4:00 p. m.	6:00 p. m.	1.84	4:55 p. m.	5:30 p. m.	0.45	0.08	0.16	0.56	0.87	1.10	1.18	1.22							
Vicksburg, Miss	26	1:05 a. m.	D. N.	1.94	1:12 a. m.	1:57 a. m.	T.	0.29	0.58	0.77	0.98	1.21	1.53	1.73	1.82	1.89					
Washington, D. C	1–2	10:45 p. m.	12:50 a. m.	0.97	10:55 p. m.	11:45 p. m.	T.	0.07	0.22	0.28	0.33	0.38	0.40	0.62	0.68	0.81	0.92				
Do	22	4:20 p. m.	6:10 p. m.	0.37	4:23 p. m.	4:33 p. m.	T.	0.22	0.33	0.35											
Wichita, Kans	1			0.23									0.18								
Williston, N. Dak.	20			0.29														0.14			
Wilmington, N. C.	5	D. N.	9:10 a. m.	1.82	4:28 a. m.	4:56 a. m.	0.88	0.14	0.30	0.43	0.62	0.69	0.74								
Do	18	3:40 p. m.	5:55 p. m.	0.80	4:12 p. m.	4:40 p. m.	0.19	0.08	0.22	0.36	0.51	0.56	0.60								
Wytheville, Va	4			0.68														0.48			
Yankton, S. Dak	18–19	9:05 p. m.	D. N.	1.76	11:03 p. m.	11:35 p. m.	0.09	0.29	0.50	0.55	0.68	0.75	0.87	0.93							
Havana, Cuba	13			0.66														0.66			
San Juan, Porto Rico	6	11:15 a. m.	12:10 p. m.	0.96	11:19 a. m.	11:39 a. m.	T.	0.12	0.43	0.75	0.92	0.95									
Do	20	1:40 p. m.	2:50 p. m.	1.23	1:45 p. m.	2:25 p. m.	T.	0.25	0.47	0.62	0.71	0.91	1.05	1.09	1.17						

*Self-register not working

TABLE VI.—*Data furnished by the Canadian Meteorological Service, August, 1904.*

Stations.	Pressure, in inches. Actual, reduced to mean of 24 hours.	Pressure, in inches. Sea level, reduced to mean of 24 hours.	Pressure, in inches. Departure from normal.	Temperature. Mean.	Temperature. Departure from normal.	Temperature. Mean maximum.	Temperature. Mean minimum.	Precipitation. Total.	Precipitation. Departure from normal.	Precipitation. Depth of snow.
	Ins.	Ins.	Ins.	°	°	°	°	Ins.	Ins.	Ins.
St. Johns, N. F	29.80	29.93	–.03	61.0	+ 1.2	69.3	52.7	3.22	–0.86	
Sydney, C. B. I.	29.98	30.02	+.07	63.9	+ 0.6	74.0	53.8	3.72	+0.10	
Halifax, N. S.	29.95	30.05	+.09	61.8	– 1.8	71.7	51.8	6.52	+2.17	
Grand Manan, N. B	29.95	30.00	+.05	61.5	0.0	68.9	54.0	6.21	+2.55	
Yarmouth, N. S	29.98	30.05	+.08	59.1	– 1.1	66.3	51.9	4.19	+0.18	
Charlottetown, P. E. I	29.95	29.99	+.05	64.0	– 0.3	72.6	55.4	2.95	–0.79	
Chatham, N. B	29.92	29.94	+.01	64.8	+ 1.6	76.2	53.5	3.88	–0.16	
Father Point, Que.	29.89	29.91	.00	57.2	+ 1.6	65.5	48.9	4.29	+1.24	
Quebec, Que.	29.65	29.97	+.04	62.5	– 0.6	71.6	53.3	5.84	+2.01	
Montreal, Que.	29.78	29.98	+.03	64.6	– 1.8	72.2	57.0	5.26	+1.69	
Rockliffe	29.48	30.00	+.04	60.4	– 2.8	72.6	48.3	4.88	+1.93	
Ottawa, Ont	29.68	30.00	+.04	64.7	– 0.1	74.4	55.0	2.91	–0.12	
Kingston, Ont.	29.71	30.02	+.04	64.2	– 2.8	71.9	56.5	4.07	+1.69	
Toronto, Ont	29.65	30.02	+.03	64.8	– 1.2	75.3	54.3	4.56	+1.80	
White River, Ont	28.65	29.96	.00	54.3	– 2.1	67.1	41.6	4.01	+0.70	
Port Stanley, Ont	29.40	30.04	+.04	63.8	– 2.1	73.8	53.7	3.23	+0.81	
Saugeen, Ont.	29.33	30.33	+.04	62.5	– 1.3	71.2	53.8	2.08	–0.17	
Parry Sound, Ont	29.26	29.99	+.01	62.7	– 0.8	73.4	52.1	3.45	+0.73	
Port Arthur, Ont.	29.25	29.96	.00	58.4	– 1.1	69.5	47.3	2.65	–0.10	
Winnipeg, Man	29.13	29.95	+.01	61.0	– 2.4	72.5	49.6	1.62	–1.05	
Minnedosa, Man	28.18	29.97	+.03	59.4	0.0	71.4	47.3	2.62	+0.52	
Qu'Appelle, Assin.	27.74	29.96	+.03	59.0	– 2.5	71.1	46.9	1.23	–0.41	
Medicine Hat, Assin	27.70	29.94	+.02	66.1	+ 0.4	81.2	51.0	0.92	–0.75	
Swift Current, Assin	27.46	29.98	+.05	62.2	– 1.8	76.3	48.2	1.06	–0.85	
Calgary, Alberta	26.48	29.98	+.07	56.6	– 2.8	70.0	43.2	2.74	+0.60	
Banff, Alberta	25.48	30.02	+.11	55.3	– 1.0	71.3	39.4	1.49	–1.04	
Edmonton, Alberta	27.71	29.98	+0.6	58.0	– 0.8	71.1	44.9	1.58	–0.55	
Prince Albert, Sask.	28.37	29.91	–.01	56.2	– 2.7	67.4	45.0	1.33	–0.82	
Battleford, Sask.	28.28	30.00	+.09	58.9	– 3.7	72.1	45.8	1.72	–0.64	
Kamloops, B. C.										
Victoria, B. C.	29.97	30.05	+.04	59.0	+ 0.3	66.8	51.3	0.50	–0.10	
Barkerville, B. C.	25.80	30.08	+.18	55.0	– 1.3	70.4	39.6	1.30	–1.80	
Hamilton, Bermuda	30.04	30.20	+.10	79.3	– 0.3	85.1	73.5	3.58	–2.50	
Dawson, Yukon										

TABLE VII.—*Heights of rivers referred to zeros of gages, August, 1904.*

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Milk River.	Miles.	Feet.	Feet.		Feet.		Feet.	Feet.
Havre, Mont	237	6	2.8	1,2	2.2	16-20	2.5	0.6
Yellowstone River.								
Glendive, Mont	98	17	5.1	1	2.6	29,31	3.6	2.5
James River.								
Lamoure, N. Dak	330	14	1.1	1,2	0.4	27,29-31	0.7	0.7
Huron, S. Dak	139	25	0.7	1,2	0.3	15-18, 29-31	0.4	0.4
Republican River.								
Clay Center, Kans	38	.....	7.6	11	6.4	30	6.9	1.2
Kansas River.								
Manhattan, Kans	160	.....	4.7	1,3	3,5	30,31	4.2	1.2
Topeka, Kans	87	.....	9.5	2	7.2	31	8.0	2.3
Missouri River.								
Townsend, Mont	2,504	11	4.2	1,2	3.5	25-28	3.7	0.7
Fort Benton, Mont	2,285	12	1.1	1	0.3	22	0.7	0.8
Bismarck, N. Dak	1,309	14	4.6	1	1.7	27	2.7	2.9
Pierre, S. Dak	1,114	19	5.6	1	3.6	30,31	4.5	2.0
Sioux City, Iowa	784	18	8.9	1	5.8	31	7.5	3.1
Blair, Nebr	705	15	7.7	1,2	5.7	31	.....	2.0
Omaha, Nebr	669	10	8.6	1,2	6.6	31	7.7	2.0
St. Joseph, Mo	481	10	5.3	1	2.3	28,29	3.8	3.0
Kansas City, Mo	388	21	12.8	1	8.7	29,30	10.5	4.1
Glasgow, Mo	231	19	8.5	1	4.4	31	6.4	4.1
Boonville, Mo	199	20	11.8	1	7.9	31	10.0	3.9
Hermann, Mo	103	24	12.4	25	8.5	31	10.3	3.9
Minnesota River.								
Mankato, Minn	127	18	2.7	1,2	2.0	25-31	2.3	0.7
Chippewa River.								
Chippewa Falls, Wis	75	16	2.0	27	0.1	15,16	0.7	1.9
Red Cedar River.								
Cedar Rapids, Iowa	77	14	3.1	1,3-7,9,10	2.8	26,28	3.0	0.3
Iowa River.								
Iowa City, Iowa	57	.....	− 0.8	1,3	− 1.4	21	−1.1	0.6
Illinois River.								
Peoria, Ill	135	14	8.4	1,2,26	7.4	19	8.0	1.0
Red Bank Creek.								
Brookville, Pa	35	8	0.6	1-3,26-29	0.4	5-25,31	0.5	0.2
Clarion River.								
Clarion, Pa	32	10	2.8	24	− 0.1	10	1.0	2.9
Conemaugh River.								
Johnstown, Pa	64	7	1.5	1,2	0.7	31	1.0	0.8
Allegheny River.								
Warren, Pa	177	14	1.0	24	− 0.7	17-20	0.1	1.7
Oil City, Pa	123	13	2.1	23	0.3	12-20	0.8	1.8
Parker, Pa	73	20	2.3	24	0.1	16-19	0.8	2.2
Freeport, Pa	29	20	3.4	25	1.3	17-20	2.1	2.1
Cheat River.								
Rowlesburg, W. Va	36	14	1.8	24	0.9	22	1.3	0.9
Youghiogheny River.								
Confluence, Pa	59	23	1.2	3	− 0.3	15,16	0.0	1.5
West Newton, Pa	15	10	2.5	3	0.3	18,19,30,31	0.6	2.2
Monongahela River.								
Weston, W. Va	161	18	− 0.2	25	− 1.9	22-24	−1.2	1.7
Fairmont, W. Va	119	25	14.1	3	13.5	18-21	13.9	0.6
Greensboro, Pa	81	18	6.6	22	6.2	14-21,29-31	6.3	0.4
Lock No. 4, Pa	40	28	7.0	1,2	5.1	20,23,24	6.2	1.9
Beaver River.								
Ellwood Junction, Pa	10	14	2.6	1,2	1.9	18-21	2.3	0.7
Muskingum River.								
Zanesville, Ohio	70	20	8.4	2	7.5	14	7.8	0.9
Little Kanawha River.								
Creston, W. Va	38	20	1.5	1	− 0.6	22-27	0.2	2.1
Great Kanawha, River.								
Charleston, W. Va	58	30	7.2	7-9	6.6	19,27-31	6.9	0.6
New River.								
Radford, Va	155	14	2.0	12	0.3	30,31	1.0	1.7
Hinton, W. Va	95	14	2.3	7,13	1.2	29,30	1.7	1.1
Scioto River.								
Columbus, Ohio	110	17	2.6	26	1.7	21,22	2.2	0.9
Licking River.								
Falmouth, Ky	30	25	3.0	21	0.7	3,4,8,9	1.3	2.3
Miami River.								
Dayton, Ohio	77	18	1.0	1,21	0.4	15,16	0.7	0.6
Kentucky River.								
Beattyville, Ky	254	30	1.0	20-24	0.3	1,3-10, 14-17, 20-24, 28-31	0.	0.7
High Bridge, Ky	117	17	9.8	22	8.9	9,10	9.3	0.9
Frankfort, Ky	65	31	6.3	23	5.4	26	5.9	0.9
Wabash River.								
Mount Carmel, Ill	50	15	2.8	24,25	1.2	17,19	2.0	1.6
Cumberland River.								
Burnside, Ky	518	50	3.6	21	0.2	8-10	0.6	3.4
Celina, Tenn	383	45	4.3	23	1.2	7,31	1.7	3.1
Carthage, Tenn	308	40	3.6	24	1.0	13	1.5	2.6
Nashville, Tenn	193	40	4.4	26	2.2	19-22	2.8	2.2
Clarksville, Tenn	126	42	5.1	27	2.9	12,23	3.4	2.2
Clinch River.								
Speers Ferry, Va	156	20	− 0.1	4,18	− 0.9	29-31	−0.5	0.8
Clinton, Tenn	52	25	4.5	16,17	3.0	6	3.9	1.5
Holston River.								
Bluff City, Tenn	170	15	2.0	2	0.0	31	0.7	2.0
Rogersville, Tenn	103	14	2.7	21	1.4	30,31	1.9	1.3
French Broad River.								
Asheville, N. C	144	6	0.8	1	− 0.7	4	0.2	1.5
Leadvale, Tenn	70	15	0.0	2,13	− 1.2	1	−0.6	1.2
Hiwassee River.								
Charleston, Tenn	18	22	3.8	16	0.7	24	1.7	3.1
Tennessee River.								
Knoxville, Tenn	635	29	2.1	16,23	0.7	1	1.3	1.4
Loudoun, Tenn	590	25	2.7	16	1.1	1	1.6	1.6
Kingston, Tenn	556	25	2.7	16	1.3	31	1.8	1.4
Chattanooga, Tenn	452	33	4.1	13,17	2.2	1,2 23,24	3.0	1.9
Bridgeport, Ala	402	24	2.5	14	1.0	2	1.6	1.5
Tennessee River—Cont'd.	Miles.	Feet.	Feet.		Feet.		Feet.	Feet.
Florence, Ala	255	16	2.7	12	0.5	1,3	1.4	2.2
Riverton, Ala	225	25	2.7	13,14	− 0.1	1	1.2	2.8
Johnsonville, Tenn	95	21	3.8	15	1.6	1-3,30	2.4	2.2
Ohio River.								
Pittsburg, Pa	966	22	6.6	25	4.8	26	5.8	1.8
Davis Island Dam, Pa	960	25	3.8	25,26	2.3	19	2.9	1.5
Beaver Dam, Pa	925	27	5.5	26	1.7	18	3.5	3.8
Wheeling, W. Va	875	36	5.1	27	1.6	19	3.1	3.5
Parkersburg, W. Va	785	36	4.8	1,28	2.7	18,19	3.7	1.1
Point Pleasant, W. Va	703	39	3.8	1,2	1.8	18,19	2.6	2.0
Huntington, W. Va	660	50	6.9	2	4.3	19	5.4	2.6
Catlettsburg, Ky	651	50	5.0	2	2.0	19	3.4	3.0
Portsmouth, Ohio	612	50	6.3	3	3.6	19,20	4.8	2.7
Cincinnati, Ohio	499	50	7.3	5	5.4	19,20	6.3	1.9
Madison, Ind	413	46	6.6	6,7,12	5.3	19,29-31	5.9	1.3
Louisville, Ky	367	28	4.0	6-8,12,15	3.5	2,20,22, 29-31	3.7	0.5
Evansville, Ind	184	35	5.3	1	3.6	25	4.2	1.7
Paducah, Ky	47	40	5.0	1	3.3	31	3.8	1.7
Cairo, Ill	1	45	16.7	1	10.8	15,18	12.8	5.9
Black River.								
Blackrock, Ark	67	.....	2.9	27	0.8	17,18	1.8	2.1
White River.								
Calicorock, Ark	272	15	3.3	25	0.4	21	1.5	2.9
Batesville, Ark	217	18	5.1	26	3.0	22	3.8	2.1
Newport, Ark	185	26	4.2	1	1.8	21-23	2.9	2.4
Clarendon, Ark	75	30	13.6	1	8.7	26	10.9	4.9
Arkansas River.								
Wichita, Kans	832	10	0.9	26,27	0.1	17	0.4	0.8
Webbers Falls, Ind. T	465	23	12.0	25	5.1	18-20	7.5	6.9
Fort Smith, Ark	403	22	11.6	26	5.6	17,18	7.9	6.0
Dardanelle, Ark	256	21	11.4	27	5.3	19,20	7.9	6.1
Little Rock, Ark	176	23	12.3	29	6.5	22	9.3	5.8
Yazoo River.								
Yazoo City, Miss	80	25	6.0	1	− 1.8	31	2.0	7.8
Ouachita River.								
Camden, Ark	304	39	11.5	10	4.2	31	6.9	7.3
Monroe, La	122	40	9.0	10	1.7	30,31	5.5	7.3
Red River.								
Arthur City, Tex	688	27	9.6	12-15	5.2	1,2	6.9	4.4
Fulton, Ark	515	28	12.0	15,16	7.0	29,30	9.1	5.0
Shreveport, La	327	29	6.5	1	1.6	31	4.8	4.9
Alexandria, La	118	33	6.5	1	2.6	31	4.7	3.9
Mississippi River.								
St. Paul, Minn	1,954	14	3.8	25,27-30	2.6	19	3.2	1.2
Red Wing, Minn	1,914	14	2.5	3	1.6	18,19	2.3	0.9
Reeds Landing, Minn	1,884	12	2.6	1	1.7	18-21	2.1	0.9
La Crosse, Wis	1,819	12	3.5	3	2.7	20-22	3.0	0.8
Prairie du Chien, Wis	1,759	18	3.4	1	2.4	23-28	2.7	1.0
Dubuque, Iowa	1,699	18	3.8	1	2.8	26,28	3.2	1.0
Clinton, Iowa	1,629	16	3.7	1	2.5	28-30	3.0	1.2
Leclaire, Iowa	1,609	10	2.4	1	1.3	28-31	1.6	1.1
Davenport, Iowa	1,593	15	3.4	1	2.6	13,15-19, 27-31	2.8	0.8
Muscatine, Iowa	1,562	16	4.3	1	3.4	16-19,31	3.7	0.9
Galland, Iowa	1,472	8	2.2	1	1.3	10-12, 14-19,28	1.5	0.9
Keokuk, Iowa	1,463	15	3.6	1	1.8	19	2.4	1.8
Hannibal, Mo	1,402	13	4.8	1,2	3.1	31	3.6	1.7
Grafton, Ill	1,306	23	7.9	23	5.7	14,15	6.6	2.2
St. Louis, Mo	1,264	30	13.0	1	8.0	13-15	10.4	5.0
Chester, Ill	1,189	30	12.1	1	8.2	14,16	10.0	3.9
New Madrid, Mo	1,003	34	14.0	1	9.0	19	10.6	5.0
Memphis, Tenn	843	33	12.5	1	6.3	20	7.6	6.2
Helena, Ark	767	42	19.5	1	9.9	21	12.5	9.6
Arkansas City, Ark	635	42	28.3	1	11.6	23	16.4	16.7
Greenville, Miss	595	42	23.7	1	9.6	23-25	13.4	14.1
Vicksburg, Miss	474	45	29.5	1	9.7	26	15.3	19.8
Natchez, Miss	373	46	32.5	1	12.3	25,27,28	18.6	20.2
Baton Rouge, La	240	35	24.2	1	5.9	28,29	12.0	18.3
Donaldsonville, La	188	28	18.6	1	4.1	25,26	8.9	14.5
New Orleans, La	108	16	12.4	1	3.9	25,26	6.7	8.5
Atchafalaya River.								
Melville, La	103	31	28.8	1	11.1	31	18.8	17.7
Mohawk River.								
Tribeshill, N. Y	42	.....	2.7	10-13,16,17	1.7	23	1.7	1.0
Schenectady, N. Y	19	.....	4.4	22	1.0	5-9	2.2	3.4
Hudson River.								
Glens Falls, N. Y	197	.....	7.5	22,23	3.1	20	5.0	4.4
Troy, N. Y	154	.....	6.8	24	1.3	19	3.9	5.5
Albany, N. Y	147	12	4.8	25	0.9	19	3.4	3.9
Pompton River.								
Pompton Plains, N. J	6	.....	4.3	21,22	3.6	18-20	3.8	0.7
Passaic River.								
Chatham, N. J	69	.....	4.6	11	2.3	19	3.2	2.3
North Branch Susquehanna.								
Binghamton, N. Y	306	16	4.4	24	2.2	15,18-20	2.7	2.2
Towanda, Pa	262	16	3.4	24	0.6	21	1.5	2.8
Wilkesbarre, Pa	183	17	6.4	25	3.2	20,21	4.3	3.2
West Branch Susquehanna.								
Lockhaven, Pa	65	12	− 2.0	1-31	− 2.0	1-31	−2.0	0.0
Williamsport, Pa	69	20	1.2	25	0.3	16-19	0.6	0.9
Juniata River.								
Huntingdon, Pa	90	24	4.1	2	3.1	26-31	3.3	1.0
Susquehanna River.								
Harrisburg, Pa	69	17	2.8	8,28	1.7	21,24	2.2	1.1
Shenandoah River.								
Riverton, Va	58	22	0.5	1-31	0.5	1-31	0.5	0.0
Potomac River.								
Cumberland, Md	290	8	3.6	4	0.7	31	2.1	2.9
Harpers Ferry, W. Va	172	18	0.9	8	− 0.7	20	0.0	1.6
James River.								
Buchanan, Va	305	12	2.9	6	1.7	31	2.2	1.2
Lynchburg, Va	260	18	1.2	5,6	0.3	27-31	0.7	0.9

TABLE VII.—*Heights of rivers referred to zeros of gages*—Continued.

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
James River—Cont'd.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Columbia, Va.	167	18	6.0	6	2.1	18,22,30,31	3.0	3.9
Richmond, Va.	111	12	0.5	15	− 0.3	31	0.1	0.8
Dan River.								
Danville, Va.	55	8	4.4	10	− 0.2	31	0.6	4.6
Roanoke River.								
Clarksville, Va	196	12	8.7	12	2.3	31	3.9	6.4
Weldon, N. C.	129	30	21.1	11	8.6	30, 31	10.8	12.5
Cape Fear River.								
Fayetteville, N. C	112	38	26.2	13	3.9	26	10.7	22.3
Waccamaw River.								
Conway, S. C.	40	7	5.8	20, 21	2.6	3	4.9	3.2
Pedee River.								
Cheraw, S. C	149	27	21.4	29	2.6	25, 26	9.1	18.8
Smiths Mills, S. C.	51	16	14.4	19	7.6	1	11.3	6.8
Lynch Creek.								
Effingham, S. C.	35	12	12.6	14, 15	4.0	29, 30	7.5	8.6
Black River.								
Kingstree, S. C.	45	24	5.7	21, 22, 29	0.3	1, 2	3.3	5.4
Catawba River.								
Mount Holly, S. C.	28	15	3.5	8, 12, 25	1.7	5	2.5	1.8
Wateree River.								
Camden, S. C.	37	15	24.5	9	5.8	25	12.9	18.7
Congaree River.								
Columbia, S. C	52	12	12.2	10	0.2	1	3.4	12.0
Santee River.								
St. Stephens, S. C.	50	12	9.6	19	5.5	4	7.8	4.1
Edisto River.								
Edisto, S. C.	75	6	5.1	15	1.8	1	3.5	3.3
Broad River.								
Carlton, Ga.	30	11	10.4	9	1.6	1	3.0	8.8
Savannah River.								
Calhoun Falls, S. C.	347	15	9.9	9	2.0	1, 5	3.8	7.9
Augusta, Ga.	268	32	25.5	10	6.7	26	10.7	18.8
Oconee River.								
Milledgeville, Ga.	147	25	11.6	8, 11	1.6	24	4.1	10.0
Dublin, Ga	79	30	6.9	13	− 0.1	21, 24	2.5	7.0
Ocmulgee River.								
Macon, Ga.	203	18	15.4	10	1.7	23, 24	5.2	13.7
Abbeville, Ga.	96	11	10.3	17	1.1	1	6.1	9.2
Flint River.								
Woodbury, Ga.	135	10	8.7	8	0.1	27	1.7	8.6
Albany, Ga.	80	20	13.2	16	1.1	1	5.8	12.1
Chattahoochee River.								
Oakdale, Ga	305	18	15.0	9	1.0	20–24, 26	.....	14.0
West Point, Ga	239	20	12.6	9	2.2	23, 24	4.6	10.4
Coosa River.								
Rome, Ga.	271	30	8.2	9	0.5	24	2.2	7.7
Gadsden, Ala.	144	22	6.6	11	− 0.6	1	1.6	7.2
Lock No. 4, Ala.	116	17	7.0	11	0.3	1	2.0	6.7
Wetumpka, Ala	6	45	24.3	9	2.6	25	8.0	21.7
Tallapoosa River.								
Milstead, Ala.	38	35	30.8	9	1.8	25	6.5	29.0
Alabama River.								
Montgomery, Ala.	265	35	22.7	9	0.8	25	5.9	21.9
Selma, Ala	212	35	22.9	11	1.5	1	7.4	21.4
Black Warrior River.								
Tuscaloosa, Ala.	90	43	10.5	14	4.7	31	6.8	5.8
Tombigbee River.								
Columbus, Miss	303	33	0.0	12	− 3.3	31	−2.0	3.3
Demopolis, Ala.	155	35	8.5	11	− 2.6	30, 31	2.6	11.1
Sabine River.								
Logansport, La.	180	45	5.0	1	0.6	30, 31	2.6	4.4
Orange, Tex.	10	7	0.4	1–8	− 0.4	31	0.1	0.8
Neches River.								
Rockland, Tex	105	20	2.3	12	− 0.4	31	0.7	2.7
Beaumont, Tex.	18	10	1.4	20, 21	0.3	27, 28	0.8	1.1
Trinity River.								
Dallas, Tex.	320	25	10.4	8	2.2	28	4.2	8.2
Riverside, Tex.	100	40	3.8	10	− 0.1	31	1.6	3.7
Liberty, Tex	20	25	6.2	14	3.9	8, 28	4.7	2.3
Brazos River.								
Kopperl, Tex	345	21	8.2	8	0.4	30, 31	1.8	7.8
Waco, Tex.	285	24	10.0	8	3.0	30, 31	4.5	7.0
Hempstead, Tex	140	40	11.5	11	− 1.0	31	2.3	12.5
Booth, Tex	76	39	4.6	19	2.6	9, 10	3.5	2.0
Colorado River.								
Ballinger, Tex.	489	21	4.0	8	1.4	30	2.0	2.6
Austin, Tex.	214	18	5.6	8	0.8	31	1.8	4.8
Columbus, Tex.	98	24	13.5	9	6.0	30, 31	7.9	7.5
Red River of the North.								
Moorhead, Minn.	418	26	8.8	1	7.7	30, 31	8.2	1.1
Kootenai River.								
Bonners Ferry, Idaho	123	......	10.4	1	5.0	31	7.1	5.4
Pend d'Oreille River.								
Newport, Wash	86	......	5.3	1	1.3	30, 31	2.8	4.0
Snake River.								
Lewiston, Idaho	144	24	3.7	1	1.6	21–28	2.3	2.1
Riparia, Wash	67	......	4.2	1	2.0	18–28	2.6	2.2
Columbia River.								
Wenatchee, Wash	473	40	22.7	1	12.0	31	17.9	10.7
Umatilla, Oreg.	270	25	10.8	1	6.1	31	5.2	4.7
The Dalles, Oreg.	166	40	16.1	1	8.4	31	12.3	7.7
Willamette River.								
Albany, Oreg.	118	20	1.6	1, 2	1.1	24–31	1.3	0.5
Salem, Oreg	84	20	0.7	1–3	0.4	24–29	0.5	0.3
Portland, Oreg.	12	15	8.7	1	4.2	31	6.3	4.5
Sacramento River.								
Red Bluff, Cal.	265	23	0.5	1–16	0.3	25–31	0.4	0.2
Sacramento, Cal.	64	25	10.3	1	9.0	31	9.7	1.3

HAWAIIAN CLIMATOLOGICAL DATA.

By R. C. LYDECKER, Territorial Meteorologist.

Meteorological Observations at Honolulu, August, 1904.

The station is at 21° 18′ north, 157° 50′ west. It is the Hawaiian Weather Bureau station Punahou. (See fig. 2, No. 1, in the MONTHLY WEATHER REVIEW for July, 1902, page 365.)

Hawaiian standard time is 10h 30m slow of Greenwich time. Honolulu local mean time is 10h 31m slow of Greenwich.

The pressure is corrected for temperature and reduced to sea level, and the gravity correction, —0.06, has been applied.

The average direction and force of the wind and the average cloudiness for the whole day are given unless they have varied more than usual, in which case the extremes are given. The scale of wind force is 0 to 12, or Beaufort scale. Two directions of wind, or values of wind force, or amounts of cloudiness, connected by a dash, indicate change from one to the other.

Rainfall for twenty-four hours is measured at 9 a. m. local, or 7:31 p. m., Greenwich time.

The rain gage, 8 inches in diameter, is 1 foot above ground. Thermometer, 9 feet above ground. Ground is 43 feet and the barometer 50 feet above sea level.

Date.	Pressure at sea level.	Temperature.		During twenty-four hours preceding 1 p. m. Greenwich time, or 2:30 a. m. Honolulu time.									Total rainfall at 9 a. m., local time.
				Temperature.		Means.		Wind.		Average cloudiness.	Sea-level pressures.		
		Dry bulb.	Wet bulb.	Maximum.	Minimum.	Dew-point.	Relative humidity.	Prevailing direction.	Force.		Maximum.	Minimum.	
	*	†	†			‡	‡		§				
1	29.92	76	70	83	71	66.3	72	ne.	2-1	6-2	29.97	29.90	0.09
2	29.94	76	70	83	74	65.5	67	ne.	2-1	3-7	29.96	29.89	T.
3	29.94	71	69	83	75	67.7	73	ne.	1-0	8	29.98	29.91	T.
4	29.94	73	70	84	71	67.3	75	se.-ne.	0	3-7	29.97	29.93	0.01
5	29.95	71	68	85	71	69.0	81	ne.	1-0	7	29.98	29.93	0.04
6	30.01	72	69	81	71	67.0	74	ne.	1-0	8	30.02	29.95	T.
7	30.02	76	68	84	72	65.3	69	ne.	0-2	3	30.07	30.00	0.00
8	29.99	72	67	83	75	64.5	65	ne.	1-4	3	30.05	29.96	0.08
9	29.97	74	67	83	72	65.5	72	ne.	2-0	4	30.02	29.95	0.02
10	29.96	75	71	82	73	66.5	74	ne.	1	5-9	30.01	29.95	0.47
11	29.98	76	69.5	85	72	69.7	78	ne.	1-0	5	30.01	29.93	0.15
12	29.97	76	70	83	72	67.5	71	ne.	1-0	5-8-4	30.00	29.94	T.
13	29.94	75	68	83	75	66.7	70	ne.	1-0	4	30.00	29.93	0.00
14	29.94	75	69	83	75	64.7	67	ne.	1-0	4	29.98	29.91	0.01
15	29.96	73	67	82	75	65.5	68	ne.	1-0	4	29.97	29.91	0.02
16	29.95	74	67.5	83	72	65.7	71	ne.	1-0	4	29.99	29.93	0.01
17	29.96	74	67	83	73	64.3	66	ne.	3-0	3-5	29.98	29.91	0.00
18	29.94	74	67	83	73	65.0	67	ne.	1-0	4	29.98	29.90	0.00
19	29.94	73	69.5	84	73	65.0	68	ne.	1-0	4	29.98	29.91	0.02
20	29.96	72	68	85	71	67.5	73	ne.	1-0	7-4	30.00	29.92	0.00
21	29.96	74	68	84	69	66.7	73	ne.	1-0	1-5	30.03	29.94	0.00
22	29.94	76	71.5	84	71	66.5	68	ne.	0	7	30.01	29.94	0.00
23	29.94	73	71.5	82	74	69.7	80	ne.	0	8	30.00	29.94	0.03
24	29.94	72	69	86	72	70.7	81	se.	0	6-2	29.99	29.91	0.00
25	29.93	71	70	84	71	70.0	81	sw.-ne.	0	0-8	29.97	29.91	0.17
26	29.94	70	68.5	83	70	69.5	83	se.-ne.	0	1-6	29.98	29.90	T.
27	29.92	71	68	86	69	69.3	80	se.	1-0	5	29.95	29.88	T.
28	29.94	75	71.5	84	70	69.7	80	se.-sw.	0	5	29.96	29.90	0.00
29	30.00	70	68	86	72	70.5	77	se.	0	3	30.00	29.90	0.00
30	29.98	77	70	87	69	65.7	69	ne.	0-1	1	30.01	29.93	0.00
31	29.95	76	68	85	75	66.3	66	ne.	1-0	4	30.01	29.94	T.
Sums	......	......	......	......	......	......	......	....	......	......	......	......	1.12
Means	29.955	73.6	68.9	83.7	72.2	67.1	72.9	....	0.6	4.7	29.995	29.924	.....
Departure.	—.021	......	......	......	......	......	......	....	......	+.7	......	......	—0.87

Mean temperature for the month of August, 1904 (9 + 2 + 9), + 3 = 77.2°; normal is 77.7°.

Mean pressure for the month of August, 1904, (9 + 3) + 2 = 29.959; normal is 29.980.

* This pressure is as recorded at 1 p. m., Greenwich time. † These temperatures are observed at 6 a. m., local, or 4:31 p. m., Greenwich time. ‡ These values are the means of (6 + 9 + 2 + 9) + 4. § Beaufort scale.

Maximum thermometer set at 9 p. m. and minimum at 2 p. m., local time.

Rainfall data for August, 1904.

Stations.	Elevation.	Amount.
HAWAII.		
HILO, e. and ne.	*Feet.*	*Inches.*
Waiakea	50	14.73
Hilo (town)	100	14.71
Puueo	85	15.71
Kaumana	1,050	18.58
Pepeekeo	100	16.32
Puuohua	1,050	21.65
Hakalau	200	17.13
Honohina	300	15.35
Laupahoehoe	500	14.70
Ookala	400	6.15
HAMAKUA, ne.		
Kukaiau	250	5.35
Paauilo	300	3.76
Paauhau	300	2.44
Paapau	......	....
Honokaa (Mill)	470	2.51
Honokaa (Meinicke)	1,100	2.45
Kukuihaele	700	3.30
KOHALA, n.		
Awini Ranch	1,100	3.39
Niulii	200	3.77
Halawa	......	....
Kohala (Mission)	521	3.20
Kohala (Sugar Co.)	270	3.34
Hawi Mill	......	....
Puakea Ranch	600	0.75
Puuhue Ranch	1,847	1.11
Waimea	2,720	1.76
KONA, w.		
Huehue	2,000	5.51
Holualoa	1,350	8.37
Kaukahoku Leheula	......	....
Kainaliu	......	....
Kealakekua	1,580	10.60
Napoopoo	25	8.39
Hoopuloa	......	....
Hoopuloa	2,300	5.65
Puuwaawaa Ranch	2,738	5.16
Huehue	......	....
KAU, se.		
Keaa Homesteads	2,000	5.25
Kahuku Ranch	......	....
Honuapo	25	4.78
Naalehu	650	5.68
Hilea	310	4.80
Pahala	850	6.86
Volcano House	4,000	8.27
PUNA, e.		
Olaa, Mountain View (Russel)	......	....
Olaa Plantation (Mill)	......	....
Olaa (20 miles)	......	....
Kapoho	110	10.89
Pahoa	600	10.68
MAUI.		
Lahaina	......	....
Waiopae Ranch	......	....
Kaupo (Mokulau), s	285	4.58
Kipahulu, s	308	4.30
Hana	......	....
Nahiku, ne	......	....
Nahiku	900	10.37
Haiku, n	700	4.02
Kula (Erehwon), n	4,000	7.20
Kula (Waiakoa), n	2,700	1.32
Puuomalei, n	1,400	4.14
Paia	180	2.58
MAUI—*Cont'd.*	*Feet.*	*Inches.*
Wailuku, ne	250	3.05
Haleakala Ranch	......	....
LANAI.		
Keomuku	......	....
OAHU.		
Punahou (W. B.), sw	47	1.12
Kulaokahua (Castle), sw	50	0.84
Makiki Reservoir	......	....
U. S. Naval Station, sw	6	1.11
Kapiolani Park, sw	......	....
College Hills	175	2.48
Manoa (Woodlawn Dairy), c	285	5.92
Manoa (Rhodes Gardens)	......	....
Insane Asylum	30	1.77
School street (Bishop), sw	......	....
Kamehameha School	......	....
Kalihi-Uka, sw	485	8.83
Nuuanu (W. W. Hall), sw	50	1.03
Nuuanu (Wyllie street)	250	3.77
Nuuanu (Elec. Station), sw	405	5.04
Nuuanu (Luakaha), c	850	15.12
U. S. Experiment Station	350	2.04
Kaliula	......	....
Laniakea (Nahuina)	......	....
Tantalus Heights (Frear)	1,360	4.63
Waimanalo, ne	300	4.78
Maunawili, ne	300	13.57
Kaneohe	100	20.07
Ahuimanu, ne	350	19.51
Kahuku, n	25	8.89
Waialua	......	....
Wahiawa	900	10.76
Ewa Plantation, s	60	1.02
U. S. Magnetic Station	45	1.05
Waipahu	200	2.80
Moanalua	15	2.23
Pacific Heights	......	....
KAUAI.		
Lihue (Grove Farm), e	200	6.21
Lihue (Molokoa), e	300	7.18
Lihue (Kukaua), e	1,000	7.58
Lihue (Kilohana)	400	6.41
Kealia, e	15	4.28
Kilauea (Plantation), ne	325	8.17
Hanalei, n	10	11.61
Waioli	......	....
Haena	......	....
Waiawa	30	0.65
Eleele	150	1.67
Wahiawa (Mountain)	3,000	22.00
McBryde (Residence)	900	8.23
Lawai (Gov. Road)	450	12.92
Lawai, w	225	4.76
Lawai, e	800	12.26
Koloa	100	4.49
Lawai Beach	......	5.36
Wahiawa (New Mill)	......	1.76
Delayed reports.		
Hoopuloa	1,650	1.77
Hoopuloa	2,300	5.97
Puueo	......	13.59
Puuohua	......	21.95
Halawa	......	6.08
Olaa Mill	......	13.62
Puuwaawaa Ranch	......	1.79
U. S. Magnetic Station	......	0.45

NOTE.—The letters n, s, e, w, and c show the exposure of the station relative to the winds.

COSTA RICAN CLIMATOLOGICAL DATA.

Communicated by Mr. H. PITTIER, Director, Physico-Geographic Institute.

TABLE 1.—*Hourly observations at the Observatory, San José de Costa Rica, during August, 1904.*

Hours.	Pressure. Observed, 1904.	Pressure. Normal, 1889-1903.	Temperature. Observed, 1904.	Temperature. Normal, 1889-1903.	Relative humidity. Observed, 1904.	Relative humidity. Normal, 1889-1903.	Rainfall. Observed, 1904.	Rainfall. Normal, 1889-1903.	Rainfall. Duration, 1904.
	Inches.	*Inches.*	° *F.*	° *F.*	%	%	*Ins.*	*Ins.*	*Hrs.*
1 a. m	26.22	26.14	63.6	63.4	92	91	0.05	0.02	2.00
2 a. m	26.19	26.13	63.2	63.3	93	91	T.	0.02	0.50
3 a. m	26.17	26.11	62.9	63.1	91	91	0.03	0.04	0.67
4 a. m	26.17	26.11	62.3	62.4	92	92	......	0.02	......
5 a. m	26.17	26.11	62.2	62.2	92	90	......	0.02	......
6 a. m	26.18	26.11	61.9	62.8	92	91	......	0.03	......
7 a. m	26.19	26.13	62.4	62.2	89	90	......	0.04	......
8 a. m	26.21	26.14	66.1	66.2	78	84	......	0.07	......
9 a. m	26.22	26.15	70.1	69.3	71	77	......	0.04	......
10 a. m	26.22	26.15	72.5	71.2	70	72	......	0.08	......
11 a. m	26.22	26.15	74.4	74.0	65	69	......	0.11	......
Noon	26.21	26.14	75.6	75.9	66	69	......	0.22	......
1 p. m	26.18	26.13	76.1	75.6	69	69	0.39	0.34	1.04
2 p. m	26.15	26.11	76.3	75.2	66	70	0.66	0.66	2.78
3 p. m	26.14	26.09	74.6	73.7	69	72	0.39	1.22	2.69
4 p. m	26.13	26.09	72.3	71.5	77	78	0.76	1.31	5.34
5 p. m	26.13	26.09	70.6	69.4	79	82	1.83	1.91	8.64
6 p. m	26.15	26.10	68.7	68.0	82	86	0.73	1.44	7.26
7 p. m	26.17	26.12	66.6	66.6	87	88	0.81	1.16	6.09
8 p. m	26.19	26.13	65.8	65.8	89	89	0.72	0.88	6.68
9 p. m	26.21	26.15	65.2	65.7	89	90	0.23	0.40	0.58
10 p. m	26.22	26.16	64.8	64.7	89	90	0.20	0.16	1.33
11 p. m	26.23	26.16	64.3	64.3	90	90	0.22	0.08	2.70
Midnight	26.23	26.15	64.1	63.9	90	90	0.09	0.04	2.34
Mean	26.15	26.13	67.8	67.5	82	84	......	......	......
Minimum	26.07	26.01	58.1	55.8	......	......	......	......	......
Maximum	26.23	26.25	82.2	84.7	......	......	......	......	......
Total	......	......	......	......	......	......	7.11	10.31	52.64

REMARKS.—At San José the barometer is 3,835 feet above sea level. Readings are corrected for gravity, temperature, and instrumental error. The hourly readings for pressure, and wet and dry bulb thermometers, are obtained by means of Richard registering instruments, checked by direct observations every three hours from 7 a. m. to 10 p. m. The thermometers are 5 feet above ground and are corrected for instrumental errors. The total hourly rainfall is as given by Hottinger's self-register, checked once a day. Under maximum, the greatest hourly rainfall for the month is given. The standard rain gage is 5 feet above ground. Since January 1, 1902, observations at San José have been made on seventy-fifth meridian time, which is 0 hours, 36 minutes, 13.3 seconds *in advance* of San José local time. The normals for pressure, temperature, and relative humidity have been adjusted to this time; the normal for rainfall in Table 1 and the sunshine observations and normal in Table 2 refer to local time. At Port Limon the hours of direct observation are 8 a. m., 2 and 8 p. m., San José local time; the barometer is 14 feet above sea level. The means for temperature and relative humidity in Table 4 are obtained from two-hourly readings given by a Richard self-registering thermometer.

TABLE 2.—*San José, August, 1904.*

Time.	Sunshine. Observed, 1904.	Sunshine. Normal, 1889-1903.	Cloudiness. Observed, 1904.	Cloudiness. Normal, 1889-1903.	Temperature of the soil at depth of— 6 inches.	12 inches.	24 inches.	48 inches.	120 inches.
	Hours.	*Hours.*	%	%	° *F.*	° *F.*	° *F.*	° *F.*	° *F.*
7 a. m	8.09	9.24	55	55	69.6	70.2	71.0	70.5	70.5
8 a. m	17.92	19.01	......	......	......	......	......	......	......
9 a. m	20.29	20.44	......	......	......	......	......	......	......
10 a. m	15.66	18.18	73	66	69.7	70.0	71.5	70.6	......
11 a. m	12.16	16.14	......	......	......	......	......	......	......
Noon	9.28	13.37	......	......	......	......	......	......	......
1 p. m	10.56	11.85	77	77	70.4	71.4	71.5	70.6	......
2 p. m	14.49	11.75	......	......	......	......	......	......	......
3 p. m	10.99	9.53	......	......	......	......	......	......	......
4 p. m	10.13	6.23	87	87	71.0	70.5	71.0	70.5	......
5 p. m	6.72	2.98	......	......	......	......	......	......	......
6 p. m	1.09	0.99	......	......	......	......	......	......	......
7 p. m	......	......	79	83	71.0	70.6	71.1	70.5	......
8 p. m	......	......	......	......	......	......	......	......	......
9 p. m	......	......	......	......	......	......	......	......	......
10 p. m	......	......	68	70	70.6	70.6	71.1	70.5	......
11 p. m	......	......	......	......	......	......	......	......	......
Midnight	......	......	......	......	......	......	......	......	......
Mean	......	......	74	73	71.0	71.0	71.0	70.5	70.5
Total	139.38	139.66	......	......	......	......	......	......	......

TABLE 3.—*Rainfall at stations in Costa Rica, August, 1904.*

Stations.	Height above sea level.	Observed, 1904. Amount.	Observed, 1904. Number of days.	Averages. Number of years.	Averages. Amount.	Averages. Number of days.
	Feet.	*Inches.*			*Inches.*	
Sipurio (Talamanca)	197	......	......	4	10.67	18
Boca Banano	10	14.92	23	8	12.20	21
Port Limon	10	......	......	10	11.42	18
Swamp Mouth	10	......	......	6	6.14	13
Zent	66	13.66	23	3	8.39	17
Siquirres	197	......	......	6	10.16	14
Dos Novillos	400	......	......	......	......	......
Guapiles	984	......	......	4	16.50	20
Cariblanco (Sarapiqui)	2,740	......	......	6	16.02	24
San Carlos	528	19.96	25	6	14.25	22
Las Lomas	873	......	......	4	7.44	14
Peralta	1,089	1.38	27	6	13.19	21
Turrialba	2,034	......	......	9	9.49	17
Juan Viñas	3,412	......	......	8	7.64	13
Santiago	3,609	......	......	3	9.13	20
Paraiso	4,383	......	......	3	10.24	16
Cachi	3,346	......	......	3	11.97	20
Las Concavas	4,386	6.02	23	3	9.09	22
Cartago	4,761	......	......	3	11.10	22
Tres Rios	4,265	5.16	12	15	9.76	18
San Francisco Guadalupe	3,894	5.94	17	8	8.62	21
San José	3,806	7.11	19	15	10.32	24
La Verbena	3,740	7.13	19	8	8.66	19
Nuestro Amo	2,595	5.59	12	8	7.72	15
Alajuela	3,117	3.86	10	4	11.30	11
San Isidro Alajuela	4,416	10.63	16	3	19.80	20
Las Cañas	2,559	4.69	8	......	......	......
Puntarenas	......	6.46	14	......	......	......

Notes on earthquakes.—None registered during the whole month.

CLIMATOLOGICAL DATA FOR JAMAICA.

Through the kindness of Mr. H. H. Cousins, chemist to the government of Jamaica and now in charge of the meteorological service of that island, we have received the following table in advance of the regular monthly weather report for Jamaica:

Comparative table of rainfall for August, 1904.

[Based upon the average stations only.]

Divisions.	Relative area.	Number of stations.	Rainfall. 1904.	Rainfall. Average.
	Per cent.		*Inches.*	*Inches.*
Northeastern division	25	25	7.02	7.69
Northern division	22	44	3.25	4.47
West-central division	26	27	7.73	9.36
Southern division	27	37	3.88	5.44
Means	100	133	5.47	6.74

The rainfall for August was, therefore, below the average for the whole island. The greatest rainfall, 22.76 inches, occurred at Moore Town, in the northeastern division, while 0.13 inches fell at Port Royal Naval Hospital, in the southern division.

Chart I. Tracks of Centers of High Areas. August, 1904.

• Barkerville

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Chart I. Tracks of Centers of High Areas. August, 1904.

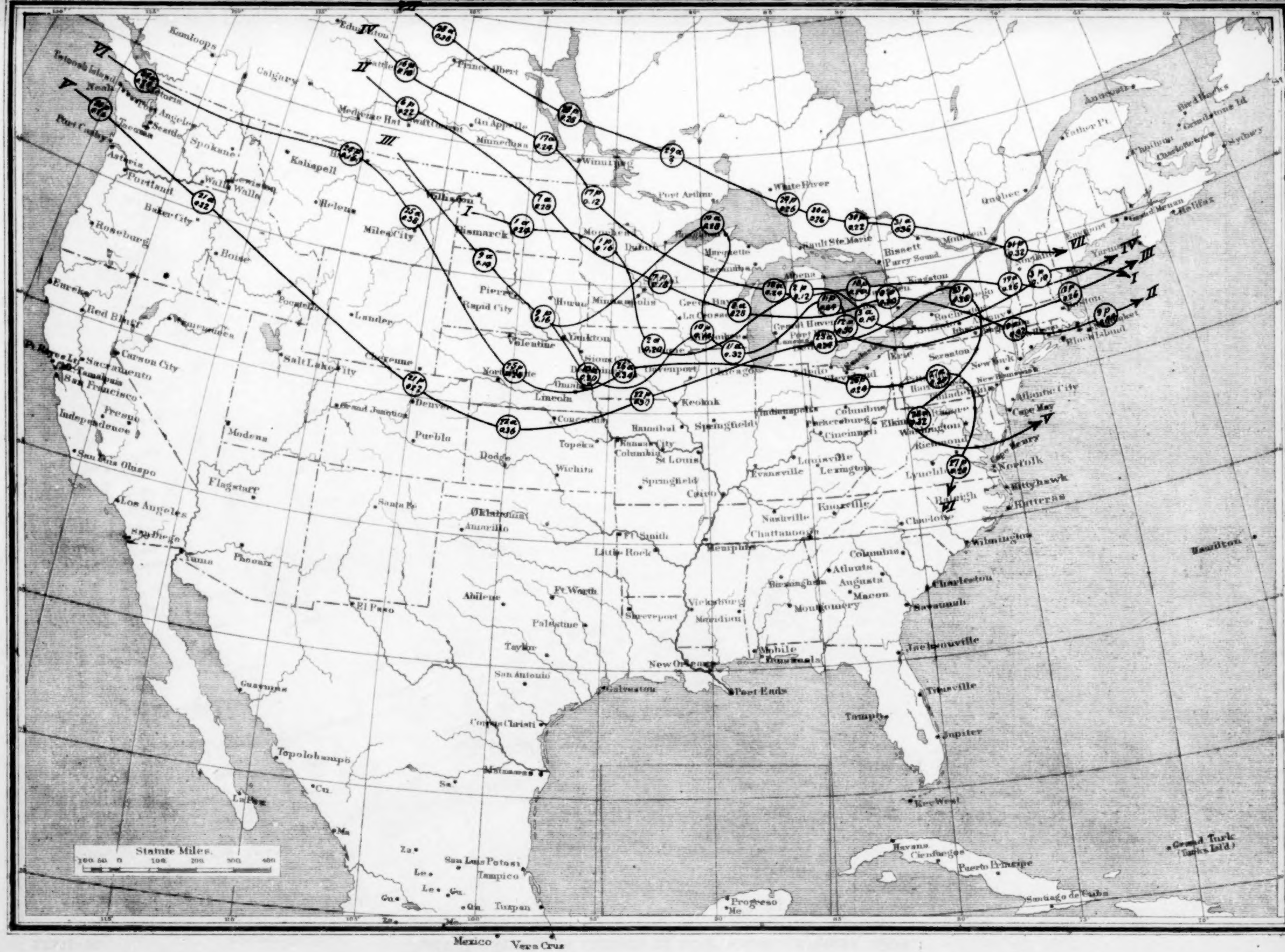
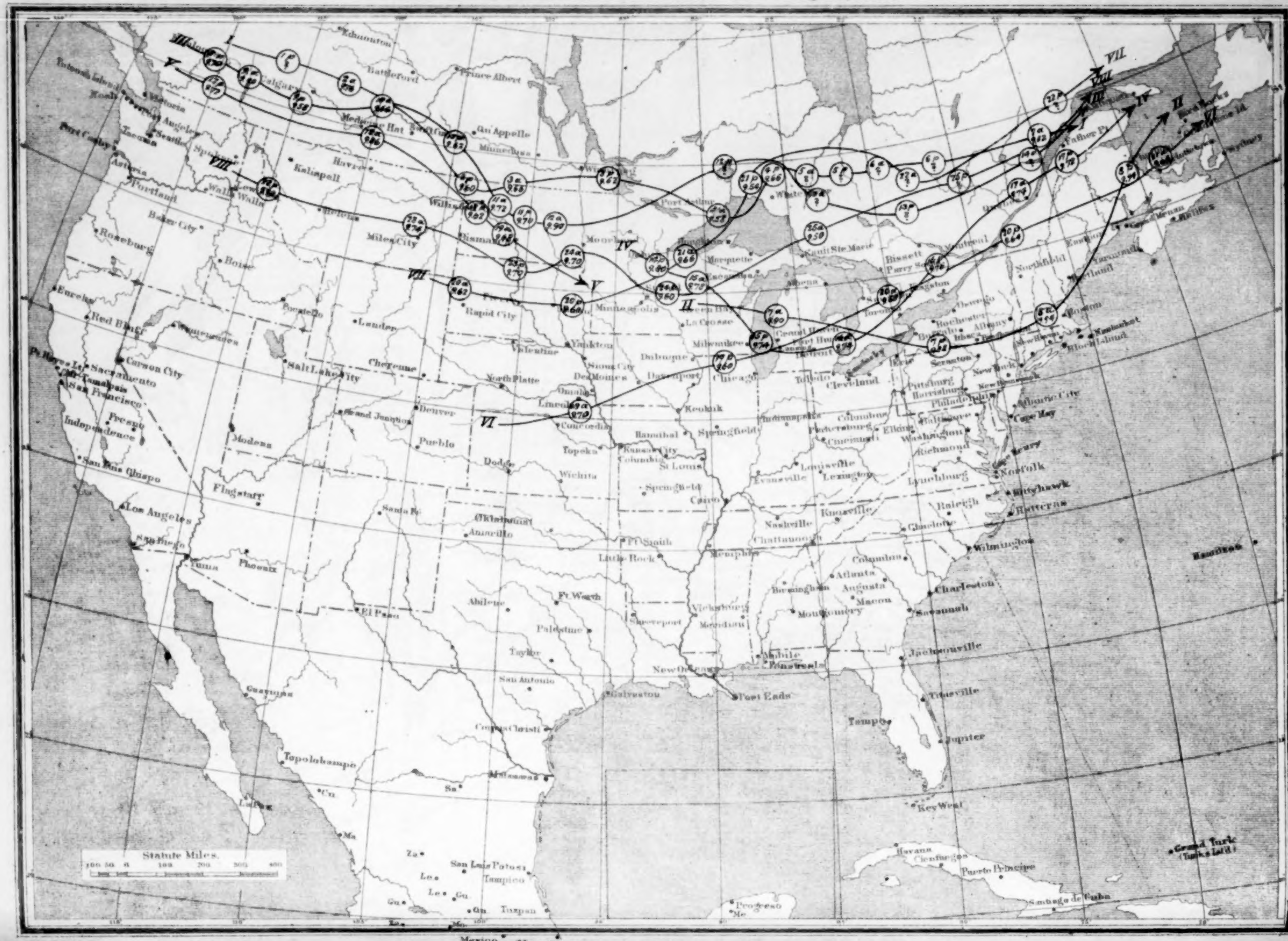


Chart II. Tracks of Centers of Low Areas. August, 1904.



Barkerville

Chart III. Total Precipitation. August, 1904.

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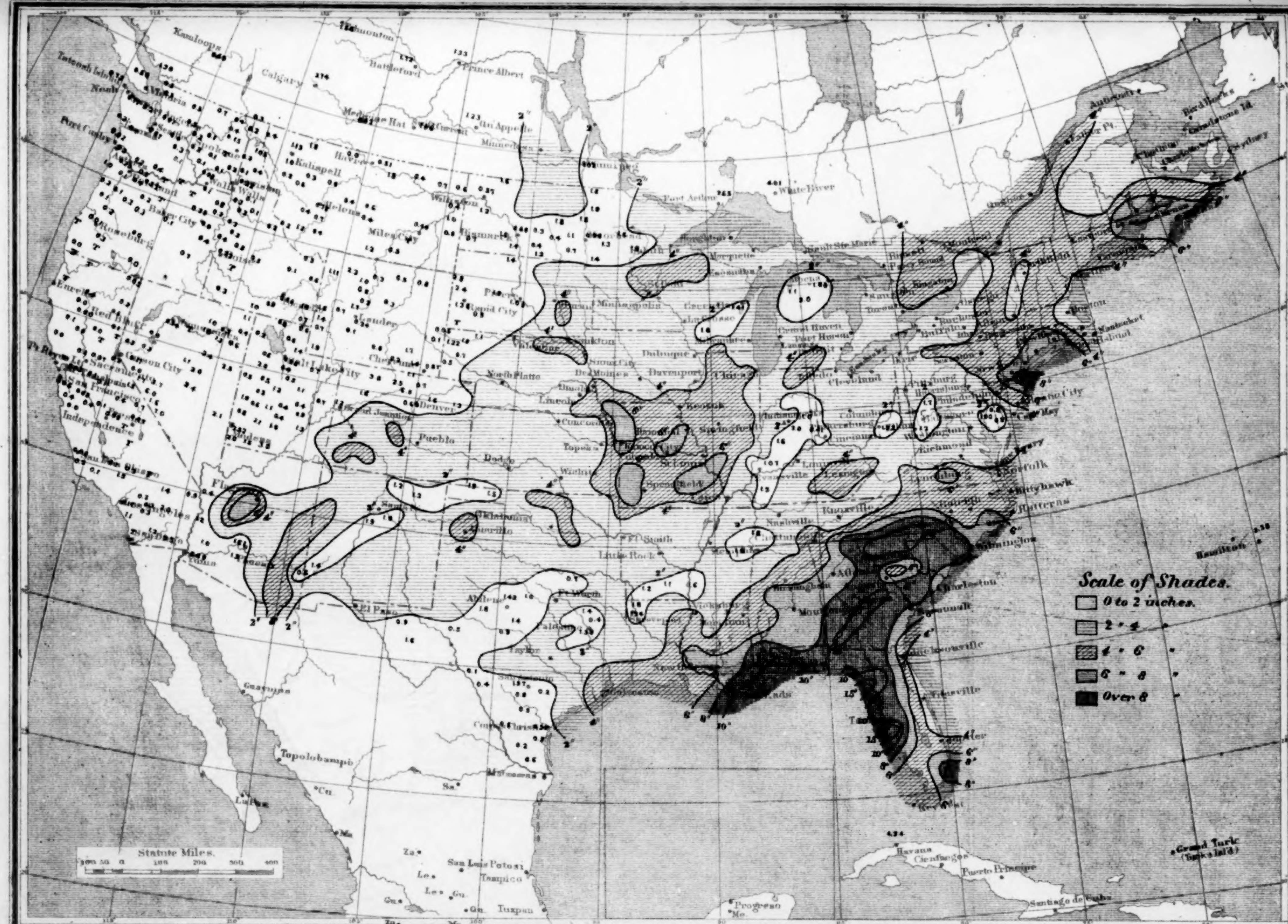
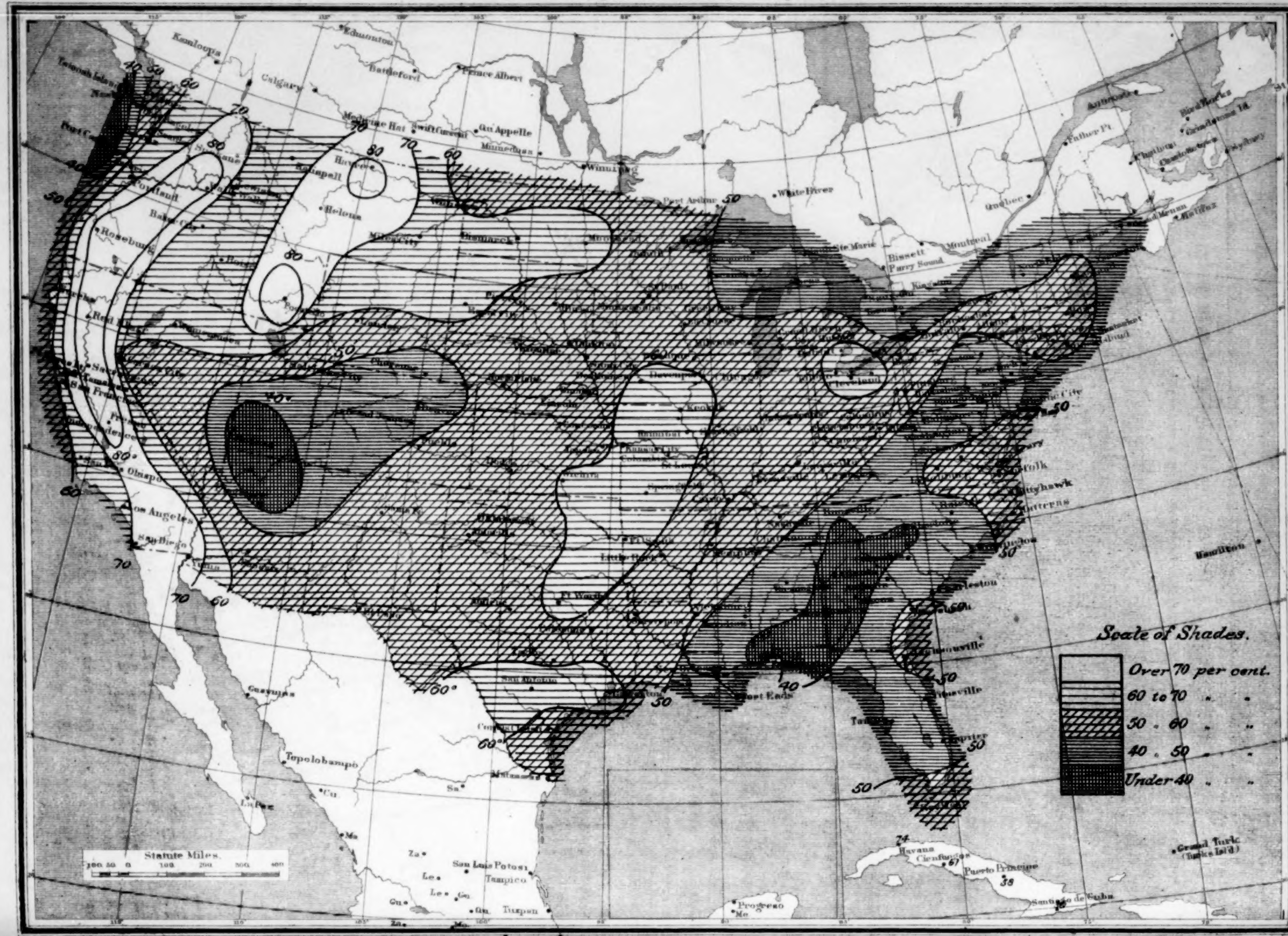


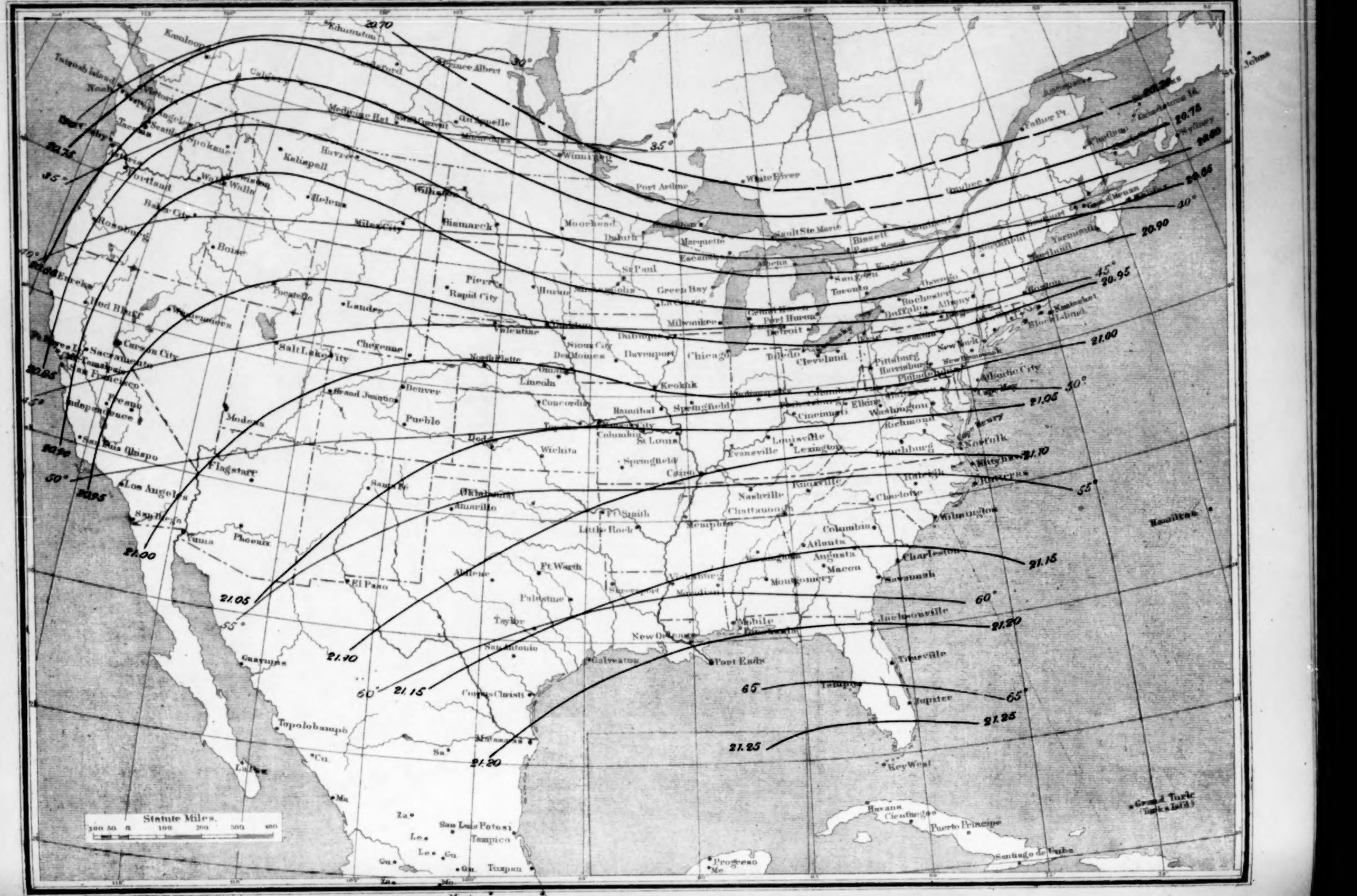
Chart IV. Percentage of Clear Sky. August, 1904.



Barkerville Chart V. Surface Temperatures; Maximum, Minimum, and Mean. August, 1904.

Chart V. Surface Temperatures; Maximum, Minimum, and Mean. August, 1904.

Chart VI. Isobars and Isotherms at 10,000 feet. August, 1904.



XXXII—100. • Barkerville Chart VII. Isobars and Isotherms at 3500 feet. August, 1904.

Chart VII. Isobars and Isotherms at 3500 feet. August, 1904.

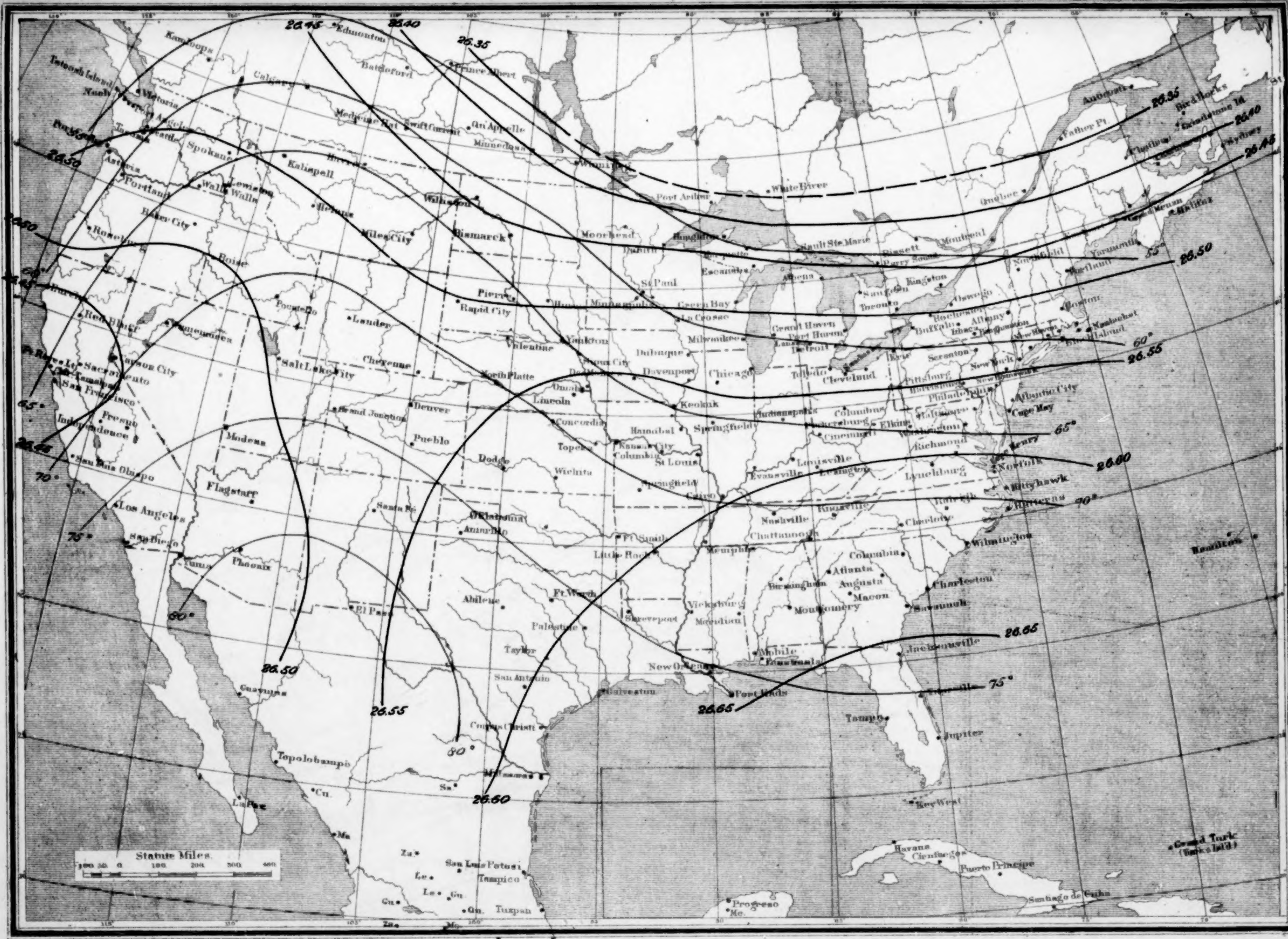


Chart VIII. Isobars and Isotherms at Sea Level; Resultant Surface Winds. August, 1904.

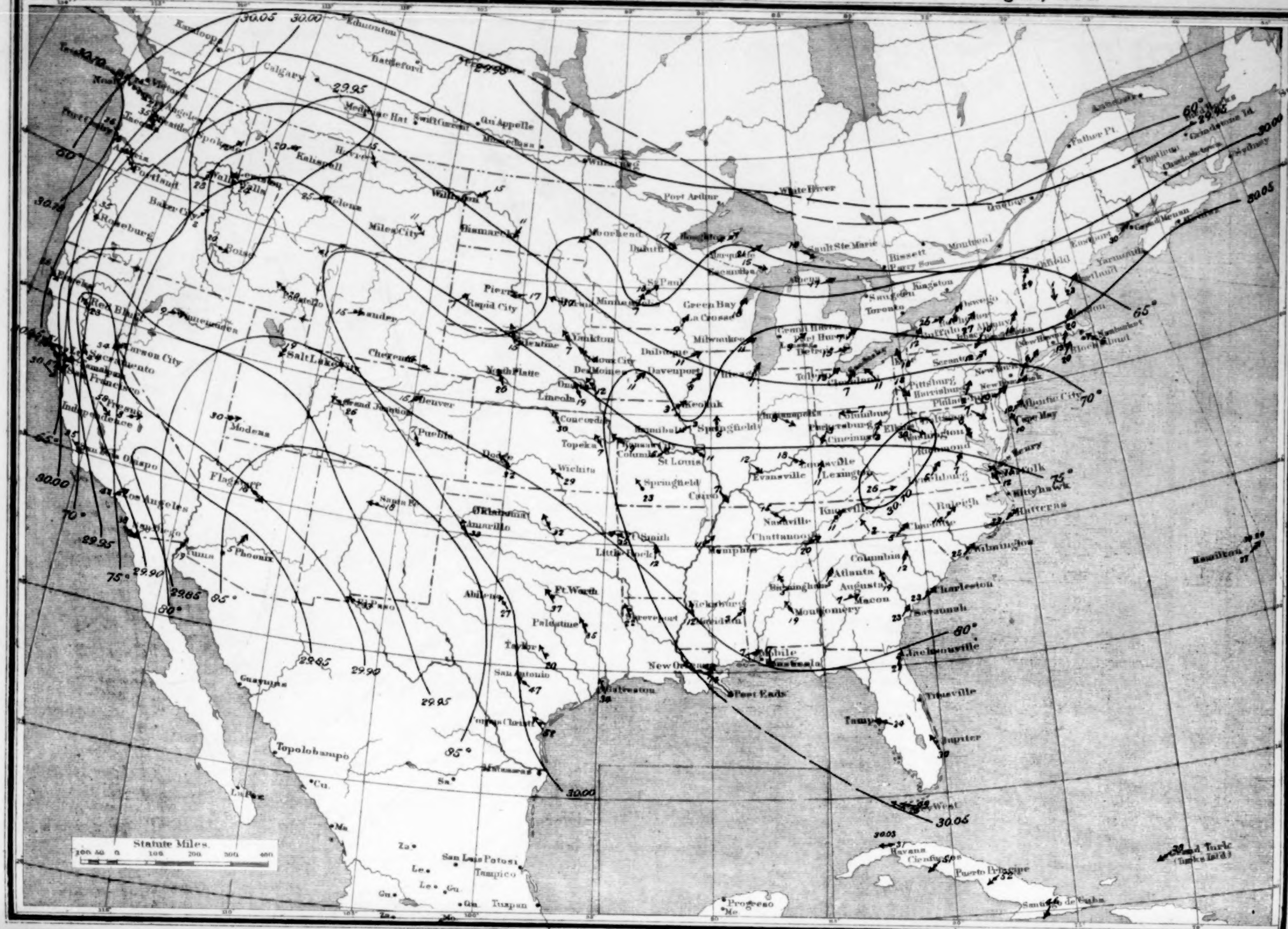


Chart IX. Sea-Level Isobars, Surface Temperatures, and Resultant Winds. August, 1904.

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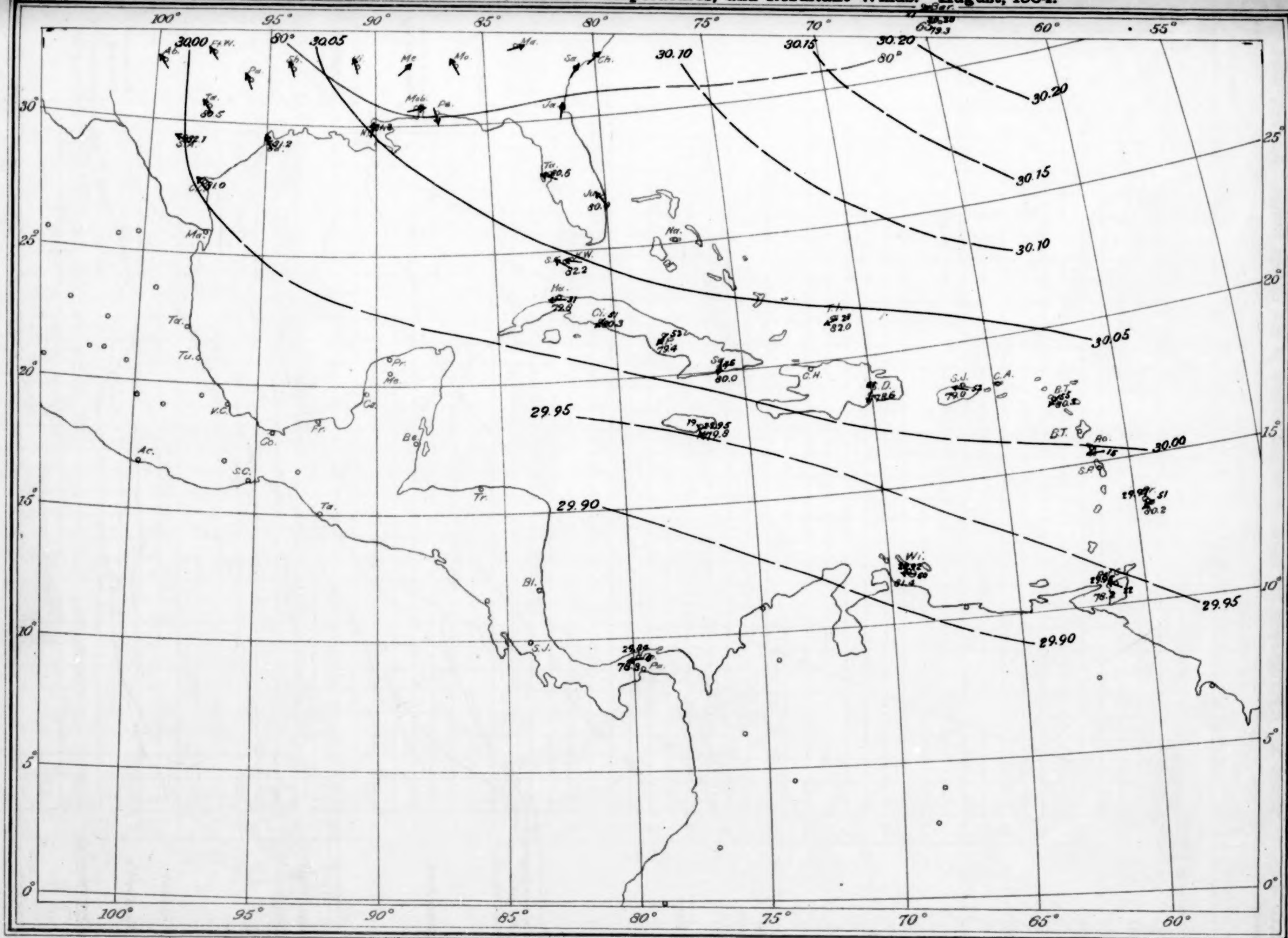


Chart X. Hydrographs for Seven Principal Rivers of the United States. August, 1904.

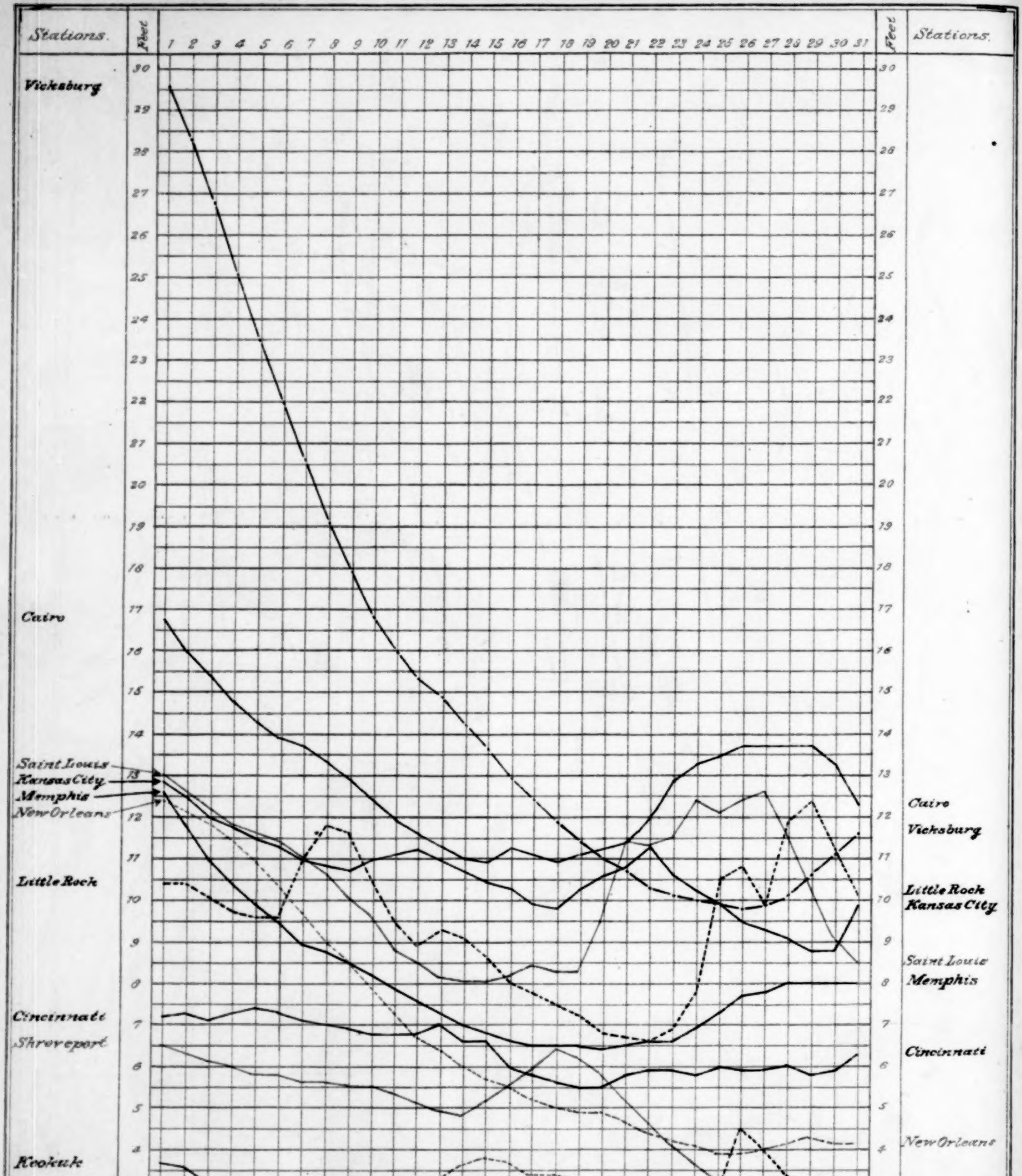


Chart XI. Monthly geographical distribution of "fast-moving" cyclones and their principal tracks for the summer half year. (Period 1893-1902.)

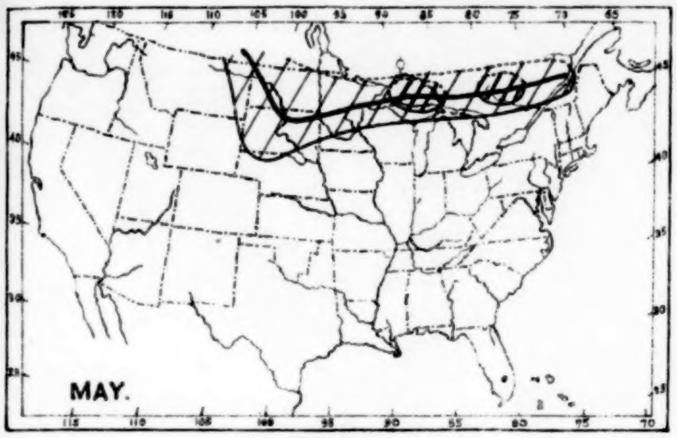


Fig. 4.

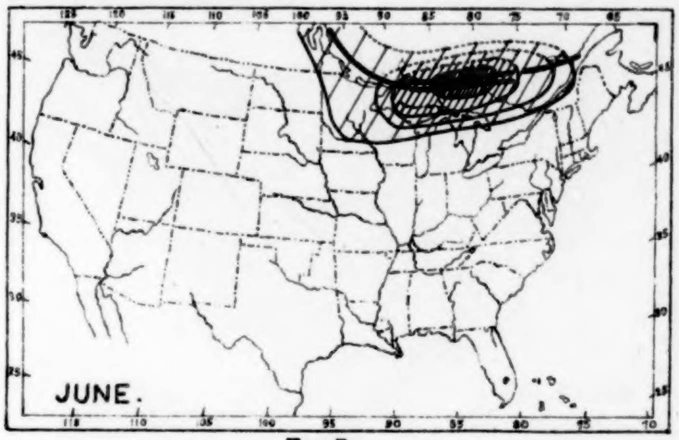


Fig. 5.

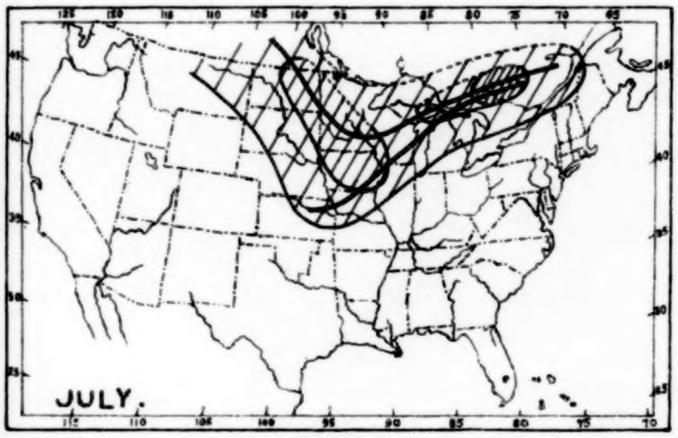


Fig. 6.

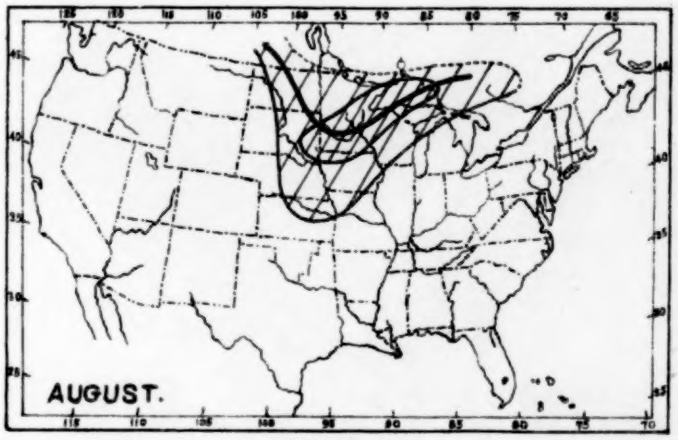


Fig. 7.

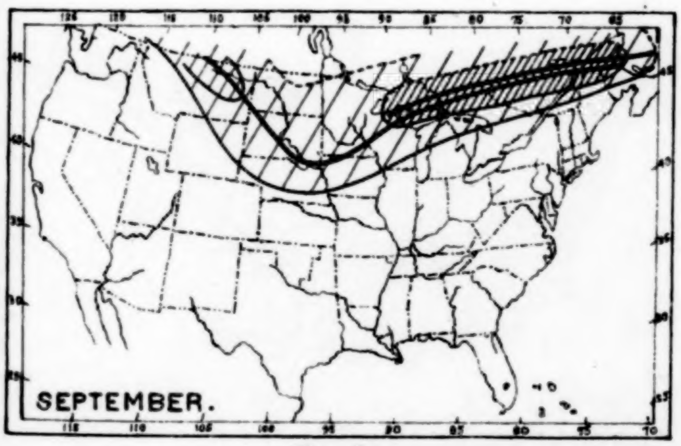


Fig. 8.

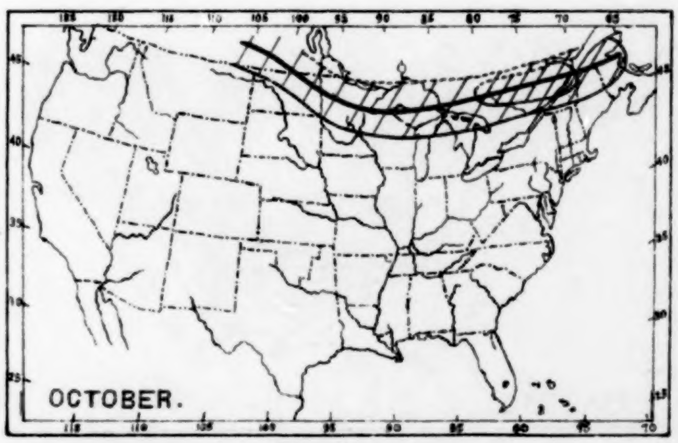


Fig. 9.

NUMBER OF TRACKS PER 5° SQUARE.

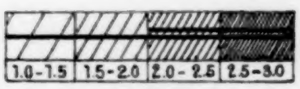


Chart XII. Geographical distribution of "fast-moving" cyclones and their principal tracks for the winter half year. (Period 1893–1902.)

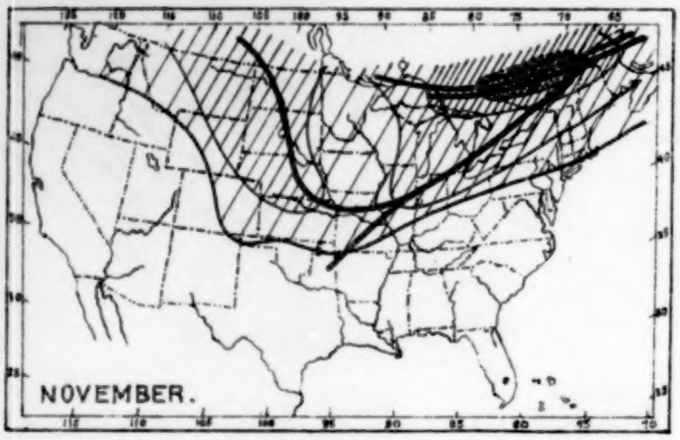


Fig. 10.

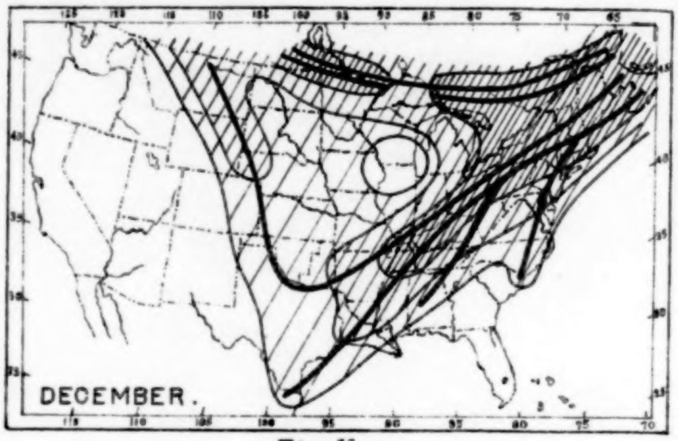


Fig. 11.

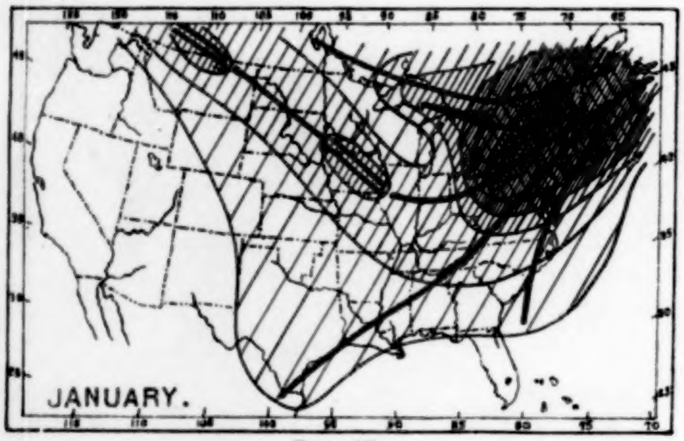


Fig. 12.

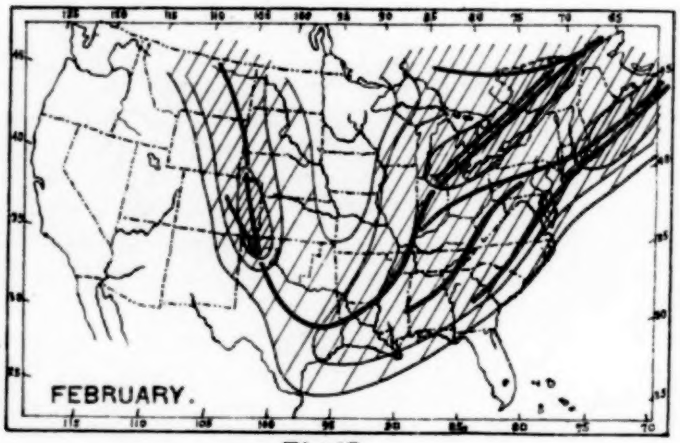
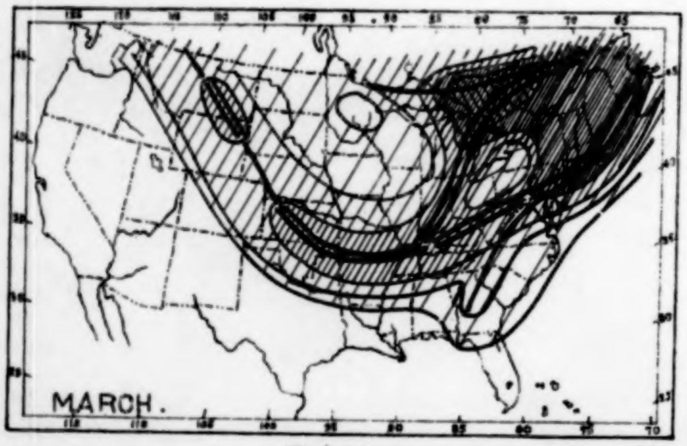


Fig. 13.



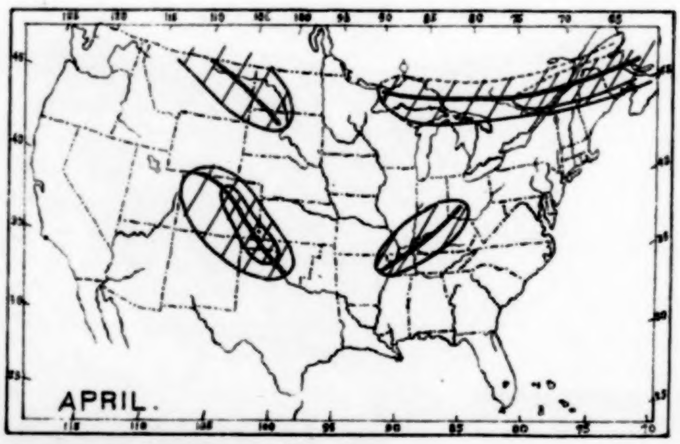


Fig. 14. NUMBER OF TRACKS PER 5° SQUARE.

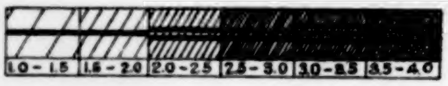


Fig. 15.

Chart XIII. Average hourly velocity of "fast-moving" cyclones. (Period 1893–1902.)

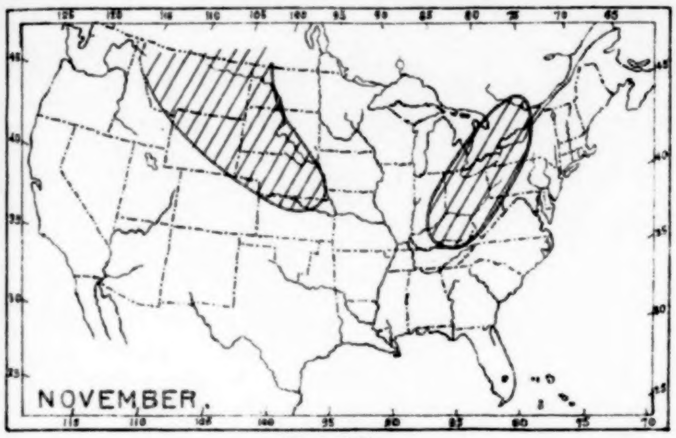


Fig. 16.

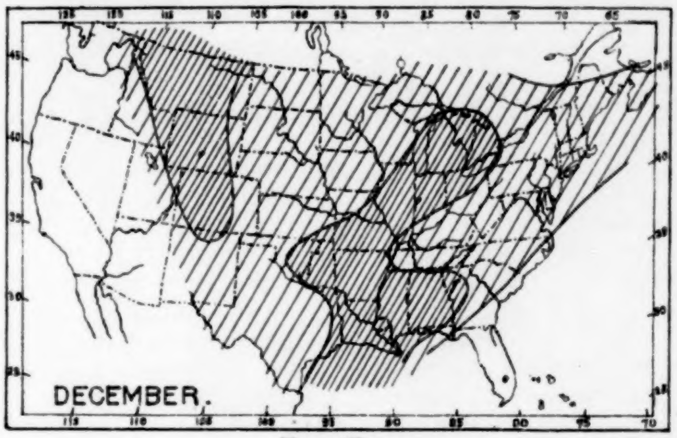


Fig. 17.

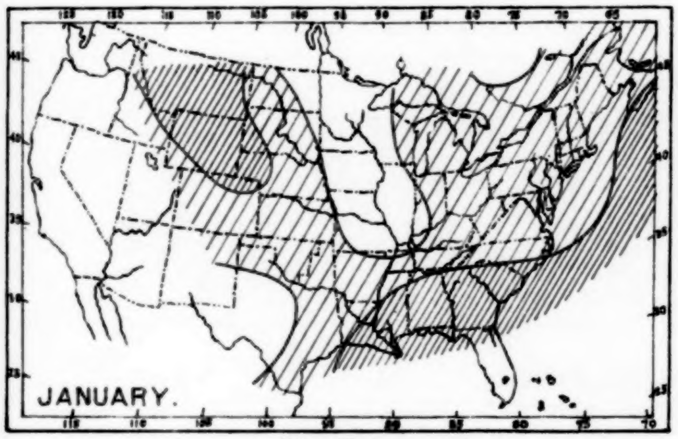


Fig. 18.

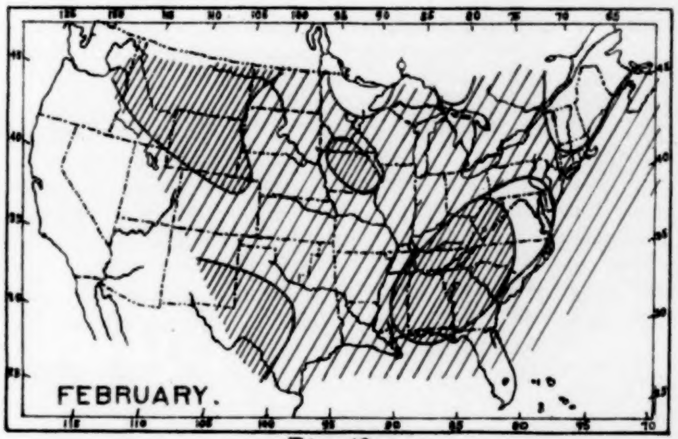


Fig. 19.

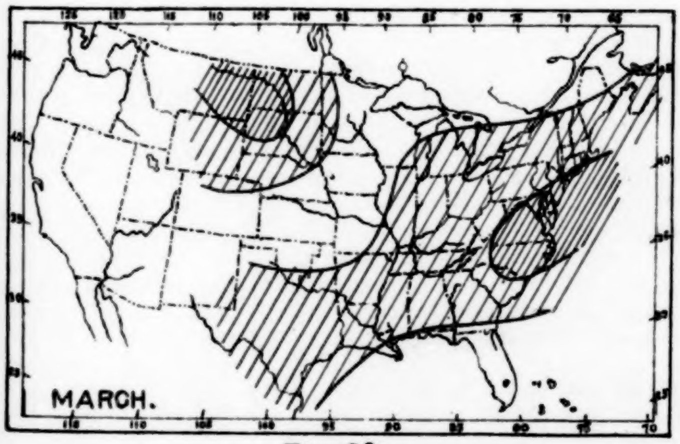
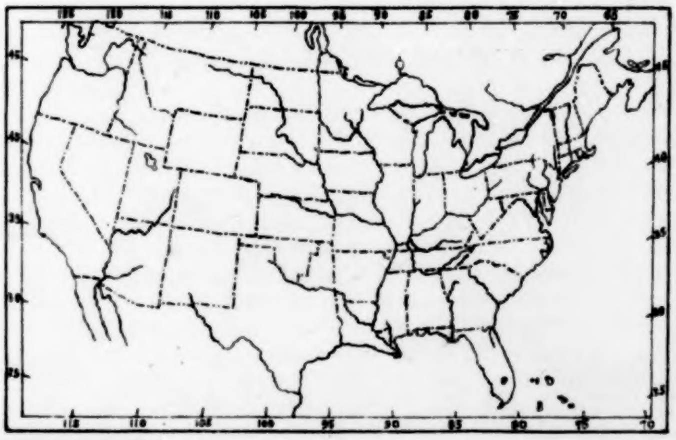


Fig. 20.



MILES PER HOUR